MAP-MAKERS

By
JOSEPH COTTLER
and
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AUTHORS OF "HEROES OF CIVILIZATION"



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FRANK BUTLER

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Map-makers

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PART I

Outlining the World

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THE MAP-MAKERS BEGIN

Once the nations of the world knew little or nothing of one another. On foot or tugging on an oar, the travellers of three thousand years ago dared not lose sight of home. What lay beyond the horizon? Who dwelt there? The questions were answered by fables or by silence. But wise or brave men could not be satisfied with that. And the young Greek, Herodotus, was both wise and brave.

WHERE the waters of the Ægean sweep out to the Mediterranean they cut sharply into the shores of Asia Minor. That is the Gulf of Kos, and the town rising from it, Budrun. It is an old town, twenty-five centuries or more in age, but then people called it Halicarnassus. There the youth dwelt whose name was Herodotus.

He was well born and well schooled. No one chanted the lines of the *Odyssey* more fluently. His uncle was a poet; and, listening to verses about gods and heroes, he, too, wished to be a writer. But somehow no muse ever sent him visions; no gods appeared to him. As he gazed out to sea, the creatures of his mind were mortal like himself. Who lived in those islands towards the west; on what soil; spoke what tongues? Somewhere to the north lay the kingdom of Lydia and its capital, Sardis. From hearsay he knew of Egypt to the south. To the east the land rose in peaks and stretches of table-land; beyond, the country of the Persians. Of the whole earth and all the races of men Herodotus knew little more, and he longed with the fire of youth to visit all the strange corners of the earth.

In his twentieth year, unable to resist the longing

for travel, Herodotus left Halicarnassus. His family feared they might never again see him. If he went north as far as the Black Sea, he would fall by an arrow of some Amazon. So taught the divine Homer. Escaping the Amazons, he would come to the land of lasting darkness, inhabited by the Cimmerians. If he went south, he was no safer. Like the sailors of Odysseus, he would come to the land of the Lotus-eaters. If he were wise and did not eat the lotus, he must come to the land of the Pygmies in the marshes of the Nile.

The seas were just as full of evil. Add sirens and monsters and the traps of unfriendly gods, and it was plain to see that the Fates had cut short the life of Herodotus. For, even outwitting all traps, he was sure to tumble off the edge of the earth.

As Herodotus passed out of sight, however, his more hopeful friends scoffed at the fears of his family. "The Phœnicians, who live on the coast of Syria," they said, "have for ages been sending their ships to the ends of the earth. Loaded with dry goods and glassware their ships sail away. One fine day they sail in with cargoes of gold and tin. They have been right round Africa, or to some unnamed region in the north-west. The Phœnicians do not say where. But they come back."

Herodotus himself put an end to the debate by coming back alive. He had travelled for seventeen years, had been to Persia, and Babylon, and the western shores of the Black Sea. He had been among the Scythians, had coasted along the shores of Palestine. His mind was crammed with information, and he settled down for the rest of his days to write a book.

This is the story of the researches of Herodotus of Halicarnassus [he began].

Now Crœsus was a Lydian by birth, King of the nations on this side of the River Halys.

Crœsus and Cyrus often glared across the river into each other's kingdom. The Persians, unlike the Greeks, do not think the gods have human forms. . . . When they meet one another on the streets, they kiss. . . . They teach their sons three things only: to ride, to use the bow, and to speak the truth. . . . To tell a lie is with them the greatest disgrace; next to that, is to be in debt.

Crœsus and Cyrus fought; and Cyrus, the Persian, being victor, overran Asia Minor and subdued all the nations as far north as Assyria and Babylon.

Babylon stands in a treeless plain [wrote Herodotus], in which the people grow all kinds of grain. The city itself is surrounded by a moat and wall of brick. Its houses are three and four stories high. . . . The Babylonian gentleman wears long hair and perfumes himself.

At Athens people heard Herodotus read parts of his book. They found themselves listening to the story of the human race. What had started as a quarrel between two petty kings, led Herodotus to tell the history of the world. Shadows were lifting from the earth for people in Athens. They saw, through the eyes of Herodotus, that where they had imagined fantastic lands and inhuman creatures, there were places and people like their own.

Sometimes the Father of History, as Herodotus is called, delighted his audience with strange tales. "I have heard," he reported, "that to the north of the Scythians lives a race of hairless people; beyond them a race of men with goats' feet, another of men who sleep six months at a time; a country of one-eyed men and gold-guarding griffins."

Herodotus did not believe these stories. "I have heard . . ." he said. He knew when he trespassed

into the lands of fancy. Some one else, not he, would have to verify the tales.

A hundred years went by. Over the ground that the lonely traveller Herodotus had explored, an army went thundering. Alexander—the Great Alexander—was engaged in winning freedom from the Persian tyrant.



SOMETIMES HERODOTUS DELIGHTED HIS AUDIENCE WITH STRANGE TALES

His staff of officers included scholars and clerks who were recording the scenery. He dispatched a corps of men into the forests round the Caspian Sea. "Does the Caspian unite with any other body of water?" he wished to know.

Bactria, Balkh, and mounting to even higher ground, Samarkand; finally the top of the desolate Hindu Kush. His scholars measure the distances. At intervals

he calls a sudden halt. There is work to do on the field, or at the walls of a town, with javelin and sword. Then on again. Alexander sees the river Jaxartes gleaming in the gorges of the mountains. As the night fires of the Greek host flare under the stars, the young conqueror talks with his scholars about the wondrous sights of Persia. The rows of javelins wind down the passes and the men of Greece stop and rest their eyes on the valley of the Indus river. They follow the river to its mouth. Now and again they interrupt their march to do a soldier's job of throwing javelins and invading towns. Meanwhile the scholars, too, display their prowess.

> The Indians [they note] are tall, thin, and much more agile than other tribes. They are to be seen on camels or horses, but the richer ride on elephants. They wear cotton garments, which consist of a tunic, and a turban, and white skin slippers. The rich men wear ivory earrings. They dye their beards various colours, even purple or green.
>
> They are divided into seven castes. Chief in honour are the Wise Men. Next comes the most numerous class, the farmers. The third class are the herdsmen, and these dwell neither in cities nor in the villages. They are nomads who roam the hillsides. The fourth class is made of artisans and shopkeepers. Then come soldiers. The sixth is a class of officials whose duty it is to report to the king the state of his empire. The last is the governing class.
>
> It is unlawful to marry out of one's class, or to attempt to change one's class. But it is permitted to one of any class whatever to join the Wise Men.

Standing on the shores of the Arabian Sea, Alexander gazes westward. "Is the Persian Gulf a landlocked sea," he wonders, "or does it join with this

one? And the regions that border these seas, what are they, and who inhabits them?" None of his scholars can answer. He details a party of his men to launch a fleet for exploration. He instructs the leader to chart with care those secret places on the earth. He needs them for his empire.

At home, the scholar, Theophrastus, is waiting impatiently for the return of Alexander. Theophrastus is writing a book on plants. "What are the plants of the earth?" he has to know. "Where does each kind grow?" From Alexander's men, Theophrastus would learn about the strange banyan, pepper, cinnamon, myrrh, frankincense, and the cotton boll. In Persia and in India, Alexander is collecting the evidence which will some day help Theophrastus to map the plant-life.

Poor Alexander the Great! He thought he was only a conqueror becoming familiar with his empire. He was really a greater man, an explorer helping to make the map. The conqueror's empire would in time crumble, but his charts would endure for all time. As his countrymen had once marvelled at Herodotus' splendid facts of the earth and its living races, they would say of Alexander's, too: "Look here, look there. Look at this body of water, at that mountain range. Here is where the river Oxus flows. From its southern plain the earth begins to rise until it is lost in the clouds. Then it becomes the Hindu Kush." Then they would remember: "It was Alexander who first revealed to us the beauties of the East as far as India." In the spring of the year, 323 B.C., Alexander marched into Babylon. There was one more thing he must do to possess his empire. He must explore its waterways, and that he would do in person. On the Euphrates

river he intended to launch his ships, sail into the Persian Gulf, round Arabia, up the Red Sea, and land at last in Egypt.

A royal fleet was begun. Early in June the ships were ready, and Alexander fixed the twentieth of the month as the day of departure. But on the seventeenth, when the men were loosening their stakes, they learned that their leader was ill. Alexander murmured that his fever was nothing, that he would be ready on time. But on the twentieth no one moved. The sick man grew worse. The voyage round Arabia was not the one Alexander was fated to take. On the twenty-seventh of June his speech failed him. One by one his men passed through his chamber to bid him farewell. The following day the man who had mapped the East as far as the Indus Valley took his last voyage, in person and alone.

II

The world had to wait two hundred and fifty years more before the Alexander of the West was born. His name was Gaius Julius Cæsar, and he was a Roman.

While Herodotus and Alexander were turning the heads of their countrymen to the east, over on the Italian peninsula arose the Roman nation. The Roman was a restless, curious fellow. He looked about him and wondered: "Who are the other people on this earth besides us?" He usually went about finding out. When he came upon a new region and another race of people, he thought: "What's here that we could use in Rome? Here's tin now. We have no tin. How can we induce these foreigners to give us some?" Usually he got the tin, or the furs, or the corn. As he invaded the north and west on his ambitious prowl,

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he marked out the way and built the roads. Wherever he went he spread his roads as a fisherman does his net. He marked his roads with milestones, measured the distances between places, and noted the scenery. Where could he settle a colony of his people? he asked of the landscape.

Now Julius Cæsar was a good Roman, and a good explorer. "All Gaul is divided into three parts," he began his book. He had led the Roman forces into Gaul, as France was then called; had lived with the natives and knew their way of life.

> The common people [he wrote] are little better than slaves. There are only two kinds of men of any esteem in Gaul—druids and nobles. The druids are the priests; and they interpret the will of the gods. They are also the teachers. They are honoured by the youth. One of their teachings is that the soul never dies.

The young student, Strabo, was spell-bound by Julius Cæsar's book. It was fascinating, he thought, wherever one opened it. Cæsar had added Gaul to the map of the Roman Empire. He had opened the way to Great Britain, for ever since his visits there the Roman was a familiar face on the banks of the Thames.

"As a geographer," thought Strabo, "Cæsar was a genius." He valued Cæsar's book even more than he did that of Herodotus, who had been a sort of fellow countryman of Strabo. For Strabo was a Greek hailing from Asia Minor. He studied, however, in Rome. Strabo's aim was to become the Herodotus of the West; his great ambition to make a geography of the entire Roman Empire.

Hercules might have had such an ambition, for the Empire radiated in all directions from Rome to the

borders of the unknown. The northern point, the rivers Rhine and Danube; the eastern, the Caspian Sea almost; and the western, the Atlantic Ocean. To write its geography would require much weary travel and labour in gathering facts. But Strabo's mind glowed when he thought of the grandeur of the Roman Empire. How could he spend his life better than to be its geographer?

Strabo began his tour up the Illyrian coast. He gathered facts about the Balkan peninsula. He climbed the rugged plains to the north. He reviewed Egypt, the soil so often trod by Herodotus, by Alexander, and by Cæsar.

All this store of learning he put into a book which delighted the people of his time, for it satisfied their curiosity about strange lands. Suppose they were ignorant about England. They opened Strabo and read:

"England is mainly level and wooded. It produces corn, cattle, gold, silver, and iron."

What were the people like? "The men are taller than those of Gaul," answered Strabo. "I myself saw youths taller than the tallest Roman by half a foot."

And how did they live? "They live in forests, in log huts surrounded by a wall."

Now the climate. "It rains rather than snows. Even on clear days the mist hangs on, so that throughout a whole day the sun shines only for three or four hours."

Strabo was proud of his exploits as a traveller. "No one perhaps of those who have written geographies has been to more places than I," he boasted. He had good reason to be proud; his was the finest geography that had ever been written.

III

Still he was not satisfied with himself as a geographer. He had gone over much foreign land and water. Yes, and were merchants to come to his house in Rome with the following question: "In what direction lies Alexandria?" Strabo could promptly answer, "South-east. It is on the coast of Egypt, twelve miles east of the mouth of the Nile."

"And Babylon?"

"That is considerably east of Alexandria and far inland. Babylon is on the Euphrates river."

But suppose a merchant were to ask: "Is Babylon north or south of Alexandria, and by how much?" That sort of question Strabo, the greatest living geographer, could not answer.

"It is impossible to make a geography," he thought, "without fixing lines of latitude and longitude." But that Strabo could not do; no wanderer could. "That work will have to be done by an astronomer," said Strabo. "By some one with his eyes on the stars."

That description fitted Claudius Ptolemy one hundred and fifty years later—Ptolemy, who usually had his head among the stars or in the world of mathematics, came to earth one day. He had seen pass across the face of the moon the shadow of the earth, and had noticed its spherical shape. He guessed about its bulge at the equator. He could understand also why there should be different zones of climate on the earth. And knowing and guessing, he thought the time had come at last to draw a map of the whole earth.

"There is only one way to go about it," he reflected. Holding steady in his mind the image of the earth as a sphere, he divided it into three hundred and sixty

equal parts or degrees. Parallel to the Equator he drew lines. Then from pole to pole he drew meridians of longitude.

He viewed his plan with satisfaction. "Now," he thought, "we can fill in these blocks with the details of the picture. Alexandria, for instance, I calculate to be on this parallel and on that meridian of longitude. So Alexandria is located."

Never stirring from his home in Alexandria, Ptolemy worked out his map of the earth. From sailors and



THE WORLD THAT PTOLEMY KNEW

travellers and books he learned what he could of the features of the earth, and he drew his map accordingly. He took Herodotus' information, and Strabo's, and Cæsar's, and that of all the shipmasters, and dotted up his criss-cross of parallels. He was already the greatest astronomer of his day, and the greatest mathematician. When his map was finished, he was also the greatest geographer.

"Why," his fellow-students said delightedly, "your scheme makes it possible to survey the earth. No more need we wonder whether Babylon is north or south of Alexandria. It is only necessary to compare their longitude and latitude."

Ptolemy agreed that his map was a great scheme. "But," he said modestly, "it is not my idea. Hipparchus deserves the credit for it."

Hipparchus had lived in Alexandria about three centuries before Ptolemy. He too had been the greatest mathematician of his time. Once he announced that the earth was a sphere.

"How do you know?" he was asked.

"I observed the shape of the earth's shadow on the moon during the last eclipse."

"Hipparchus was the first to divide the earth into three hundred sixty degrees," said Ptolemy, "and it is from him that I have borrowed the scheme of drawing meridians on a map."

Had Hipparchus been alive to acknowledge the praise of Ptolemy, he might have said with similar modesty, "Thank you, but really you have the wrong Greek. You mean Eratosthenes. I have merely followed his suggestions."

About a century before Hipparchus, the chief librarian at Alexandria had been Eratosthenes. "Friend-of-learning" the Greeks called him, for he was one of the most learned men in the world. When he heard people speak of falling off the edge of the earth, he laughed. "The earth has no edges," he said. "It is a sphere. Watch its shadow on the moon at the next eclipse. You will see that it is circular."

He had another proof. "When you travel, say from north to south, familiar stars disappear and new ones arise. That can only happen of the earth is round."

To those who agreed that the earth was a sphere, the question arose: "How large round is it?" It is incredible almost, but this scholar who stayed in Alexandria, who had no instruments to help him, figured

out one day that the circumference of the earth is about 24,000 miles. He erred by only about eight hundred miles.

He made still another wonderful prophecy. The tides in the Indian and the Atlantic oceans, he knew, were the same. "That proves," he said, "that it is possible to sail from Spain to India round Africa."

It took seventeen hundred years for his prophecy to come true.

It was Eratosthenes who first put parallels of latitude and longitude on the map. Hipparchus improved the scheme by putting them at equal intervals. And Ptolemy further perfected the map by locating some eight thousand places on it.

The map-makers had begun their work. The explorers—Herodotus and Alexander and Cæsar and Strabo—had blazed the way to new regions. From India to the British Isles, from the Mediterranean to the Baltic, new races of living things came to light. They lived in different homes, in different weathers. They had different ways of living. . . . To know the earth and its creatures, from the floor of the ocean to the region of the stars: that is geography. Filling in the blank spaces of Ptolemy's map: that is the adventure of the explorer.

MARCO POLO

A TRIP TO CATHAY

From the North new races swept down and settled in the Mediterranean lands. A thousand years after Strabo, Europe knew itself. Sails and the mariner's compass made travellers by sea more bold. Merchants from the great port of Venice sent their ships as far as Norway. But to the east of Europe stretched Asia, a land of mystery. The Venetians often looked eastward, and among them the boy Marco Polo.

MARCO POLO was fifteen years old, and like the other lads of Venice used to go down to the port. But he was different from the others. To see him, alone among the boys of his age, loitering round the groups of sailors that gathered in the shops on the wharf, one would have said Marco was a born seafarer. And yet the born sailors among his chums were never with him in the shops, where he sat all ears to the mariners' yarns. His comrades were drawn rather to the hulk of the ship, about whose beaten sides they would play.

Marco did not care for the sea. But he loved the company of men who had seen far lands and strange peoples. To satisfy his curiosity about far-off things he would sit for days on the quay, waiting for a ship to come in. The tiniest speck on the horizon made him spring up excitedly.

As the ship glided in slowly, alive with cries of the men, Marco scanned the deck for a kindly face. To the first sailor who put foot to shore he usually sidled up. "Where have you come from?" he asked, and then listened intently.

He heard tales about a land of people with only one foot; of another peopled with giants with one eye in the middle of the forehead. Perhaps he heard of that race who are headless, whose eyes gleamed from their shoulders. He enjoyed the horror of listening to stories of deserts in which prowled horrid monsters, and tales of islands inhabited by cannibals fifty feet tall.

Such tales! Marco had never heard of Strabo and Hipparchus, and the other sensible geographers of Greek and Roman days. Ptolemy had died more than one thousand years before, and it was as though he had never lived. The Roman Empire was no more. War on all sides had broken it to bits. And ignorance was the price of war. Once again monsters seemed to stalk the earth, and fearful countries, sunless or flaming, lay beyond the horizon. Many believed that the earth was shaped like a box. In the north rose a high mountain, round which, in the daytime, the sun turned. At night it rested behind the mountain. Beyond the mountain lay paradise.

From the port of Venice, Marco often gazed out on the waters of the Adriatic. His father, Nicolo, and his uncle, Maffeo, had left Venice many years before. They had started out as rich jewel merchants on a business trip to the unknown lands north of the Black Sea. For ten years they had not been heard from.

Marco did not remember their leaving; he had been a toddling child then. But he was told that his father and uncle would very likely turn up again in Venice some day; that they had gone far into the unknown parts of Asia, and that such a journey took a long time. They must be safe, because it was rumoured that those lands were ruled very peacefully by a great emperor. But there were contrary rumours that made the heart

of Marco pound with anxiety. The old men of Venice remembered the day that the Mongolian chieftain, Jenghiz Khan, had marched into Europe from Asia.

His army had been more terrible than was Alexander's when he conquered the East. Over the vast Asiatic plains, Jenghiz Khan had thundered. He had battered down the defences of Persia. He had raided Armenia and Syria. At the frontiers of Europe, no one could stop him. His men had crossed into Russia, and had trampled upon the forces of Poland and Hungary.

"In a country that bred such people as Tartars and Mongols, what European was safe?" thought Marco.

Yet the good friar Carpini risked going there. Uneasy about the intentions of the Asiatic host, the Pope ordered Carpini to the court of the Khan. In April, 1245, the friar started from Lyons. Clear across Europe he travelled. On the Volga river he stepped into the area of the Mongols.

"Is the great Khan here?" he asked.

No, the Khan was holding court somewhere near Karakorum in Mongolia. The friar, who was sixty-five years old, strode across the Russian steppes, out of Europe.

Two years passed. Europe had given up hope of again seeing the fearless friar, when one day he stepped into Kiev. At sight of him, a continent of people cheered with delight. "Where have you been?" they asked. "Tell us about the Tartars." "What said the Khan?"

The friar had been the first European to traverse the Mongolian plains.

"I have been through swamps, wastes, and biting winds. The Tartars? A race of nomads and shepherds. They sleep in tents of felt which they call 'yurts.'

In the summer they live mostly on kumiss, which is a kind of fermented milk. The men shave a square on the tops of their heads, but leave a tuft of hair on the crown, which they plait into a queue. They have high cheek-bones. Their noses are small and flat."

Thus had the friar Carpini described the Mongolians.

Somewhere in the midst of this rough people and rough climate were Marco's father and uncle. Surely it was a vain hope that brought him every day down to the water's edge.

But one day a ship brought in two strangely clad persons. Yes, they were the Polo brothers, richer than ever, with a strange tale on their lips. Marco danced about them delightedly.

"Tell me, tell me," he pleaded.

What adventures! The travellers told of wild horsemen, of magicians, of a desert inhabited by evil spirits. But most of all they told of a marvellous country thousands of miles away, across the seas and lands of Asia, the land of the rising sun.

"You in Venice," said Nicolo Polo, "think you are the greatest nation on earth; you think your city the most beautiful, the richest, and the mightiest. But we have seen cities in comparison with which Venice is a dark corner. Listen! Near the Yangtze river stands the city of Hangchow. Like Venice, it rests upon lagoons of water, but its bridges are built of stone. And how many do you imagine there are? Twelve thousand! Hangchow is fifteen times as great as Venice! Its main street is two hundred feet wide and lined with houses, gardens, shops, palaces, and temples. Along the canals are the warehouses of great merchants among whom we were like poor men. The wealth of

the world is heaped in its market-places—spices, drugs, silks, and pearls. Through its streets saunter lords and ladies, the most beautiful in the world, wearing their jade and jewelled earrings. And the sails that crowd into the city unload a hundred times more pepper than is in all the ports of Europe. From India come spices, aloes, sandalwood, nutmegs, spikenard, ebony."

"Suchow is near by," Maffeo said, "swarming with people. Suchow has so much silk that even the poorest always dress in silk, and ships sail away laden with it."

"Are there many cities like these two in your China?" asked the Venetians, doubtfully.

"Many. And the emperor of all, the great Kublai Khan—'khan' means 'lord'—received us kindly and entertained us with feasts and gifts."

The Venetian merchants were amazed, but they did not favour this sort of talk.

"Greater than Venice!" they whispered. "The Polos have dreamed this together with their enchanted deserts."

It was a proud thing to be a merchant of Venice, and the Venetians would admit no rivals. When a son was born there, the Venetians used to say: "A nobleman is born into the world."

For Venice was the meeting-place for the East and West. All the wealth that poured into the West had to come first to Venice. Jewels and spices, silks and carpets, were piled every day on its quays—brought in from Egypt, from Persia, and from the Syrian desert. To Venice the West sent its German metals, English woollens, and furs of the North.

Young Marco heard the doubts cast upon the stories his father told.

"Is it true," he asked him anxiously, "what you tell?"

"You will see," his father said. "We are going back to China shortly, and we'll take you with us." Nicolo Polo continued, "But first we have a letter from the Khan to the Pope. The Khan sends greetings. He is very much interested in the learning of Europe. He asks us to send to Cathay one hundred teachers and scientists."

II

The palace at Chandu was brilliantly adorned for the three Western travellers, the first to visit the court of the Kublai Khan. The great reception-hall was spacious and handsome. Stately red columns upheld the ceiling. Its walls were carved with gilt dragons and finely wrought birds and beasts.

Young Marco was dazzled. He could hardly believe such magnificence real. On the throne sat Kublai Khan, smiling graciously upon the bewildered youth.

"The young man—who is he?" the Khan asked Nicolo Polo.

"Sire," answered the father, "this is your servant and my son."

"He is welcome, for he pleases me," said the kind emperor, and he inquired about the long journey from Venice to his court.

Nicolo made answer, while Marco keenly observed the Khan. The emperor was about sixty years old at this time, but still hale and hearty. He was of middle stature, with handsome black eyes.

Marco's father was telling the Khan of their adventures—three and a half years of weary travel. He told how they had sailed from Venice to Acre, and

then made their way to Bagdad, where they stopped for a time.

"It is a most noble city, O Khan," Nicolo exclaimed, "this country of the date palm; where silks are woven with gold, and gorgeous damasks and velvets are fashioned." The merchant's eyes glowed. "The people are well spoken and learned, for law, physics, and astronomy are studied zealously. Across Persia we made our way—the home of the brilliant turquoise and ruby, the mart of spices and pearls and ivory. In the hot plains of Persia my Marco fell sick and would have died, but I took him to the mountains, where the pure air made him well."

The emperor's kind eyes fell on Marco for a moment. "If he is not yet fully recovered, he may stay here in Chandu in my summer palace where we will make him as strong and happy as we all are here."

"And then," continued Nicolo, "we came to Balkh. For days on end we struggled with the steep passes of the Pamirs. At last we dropped down into Kashgar. Straight on lay the towns at the foot of the Kuenlun mountains, and we pushed ahead. We passed Yarkand, Khotan; we skirted south of Lob Nor, and crossed Ardos. The stretch before us seemed endless. To see at last the roofs of Peking was as a vision of the gates of Heaven."

Kublai Khan took a strong fancy to young Marco, and they became fast friends. In Marco Polo the Khan saw a keen and observant youth who could be of use to him. He sent Marco on tours throughout the vast Chinese kingdom, and for a time made him governor of a province. To the ears of the emperor, the young Venetian brought back stories of the customs of the Khan's people. He pictured the far-flung empire full

of peace and quiet sunshine, of wealth and commerce, and learned men and beautiful things. The Khan's ears fairly tingled at Marco's reports.

"My own men never saw such things," he said. "And I had rather hear about the ways of my people than about any business whatever."



KUBLAI KHAN'S EARS FAIRLY TINGLED AT MARCO POLO'S REPORTS

The young Marco was a blessing to the Khan. Far and wide in the Chinese empire he travelled, and even beyond: to Siberia, into the Gobi Desert, across Tibet, everywhere into strange lands where never had Europeans trod before. And wherever he journeyed, he noted carefully all he saw and heard. He picked up the many languages of the empire. He lived in the small villages that dotted the plains. He roamed with

the nomad tribes of the vast spaces. Then back he would go to Peking or Chandu to satisfy the great ruler's curiosity.

"This young man," said the grateful Khan to his courtiers, "is a person of great worth and ability."

Marco was amazed. When he was a boy in Venice, he believed Europe to be the only civilized place. Yet here, thousands of miles away, in a part of the earth unknown to Europeans, there lived a great people, kind and pleasant, richer, better governed, and more peaceful than the Europeans. He marvelled at the conveniences in Chinese life, almost unknown to the European people: paper money, for instance, and coal.

"The people of China," he felt sure, "are far more civilized than we Europeans." He was thinking perhaps of the city of Kin-sai, "The Celestial City," where he enjoyed pushing his way through the crowds in the shopping districts or strolling through the quiet, paved streets lined with houses and gardens.

Did he want a bath before dinner? Kin-sai had excellent bath-houses!

The fire patrol and fireproof buildings reassured him so that he could sleep contentedly in his bed. The hospitals, free to the poor, made him feel safe. And best of all, he liked the handsome and courteous people. He found them honest and peace-loving. No gentleman, for instance, would keep weapons in his house; the thought of strife was unbearable to him.

The Khan was a gracious ruler, just and charitable always. He took care that his subjects never suffered poverty. Whenever there was a poor harvest in crops, or a pestilence among the cattle, he did not take his taxes that year. More than that, he sent grain and

cattle from his own stores to relieve the suffering. For the poor and unemployed he had relief. All this Marco wrote down in his note-book.

III

Seventeen years passed. The Polos began to feel a longing to see Venice again before they died, to hear the joyous Italian songs rising from the gondolas.

One day the old Khan called them to him. "You have been very faithful to me," he said, "be faithful still. The Khan of Persia wishes to marry one of our Mongol ladies, but the voyage to his country is long and dangerous. I fear to trust my own men with the life of the dear girl. But you, who are such skilful navigators, could be trusted to convey her safely down the China Sea, past Sumatra, Ceylon, Southern India, and across the Indian Ocean to Persia. Will you do it?"

The Venetians bowed. The journey lasted two years. When they at length entered the Persian Court, they were received with great honour. But in the midst of the rejoicing, the news burst in upon them that Kublai Khan was dead.

"Kublai Khan is dead! The great Khan is dead!" sounded over the wide plains, and the great Chinese empire began to mourn.

Their friend gone, the Polos resolved to continue their way west. After twenty years the thought of Venice was good. And so home they journeyed, laden with precious stones and presents for their countrymen.

As they sailed up the canals of their native city, they felt like strangers. No one recognized them. "The Polos!" their old friends said. "They are dead somewhere in the Orient."

Marco explained, and the Venetians were at last convinced.

"Tell us a story! Tell us a story!" clamoured the young boys, plucking Marco's sleeve. He remembered his own boyhood in the port, and he began to talk.

"You Venetians think this is the most magnificent palace in the world," he said, pointing to the Doge's palace, "but compared to the one in Chandu, it is a hut!"

His listeners were not impressed. "We have heard amazing stories," they said, "but none so impossible as that there is a finer thing in this world than our Doge's palace. Tell us rather of the country where dwell giants fifty feet tall, and ladies with jewels for eyes that slay one to behold them——"

"That is Venice," said Marco gallantly; "and of the giants fifty feet tall I have but heard, not seen, although I have visited islands in the Indian Ocean where there are apes so large that they seem to be men. But I prefer to tell you of the moist monsoon that strikes the Himalayas and swells the stream of the Ganges; of the elephant's bulk; and the tiger's sinews."

"And the pygmies?" they asked eagerly. "Are they not so small that they are nourished on the smell of apples? What of the giant roc's eggs? Did you visit the Land of the Jinn?"

The traveller shook his head. He longed to delight them with pictures of Cathay's mists, its plunging torrents, and the image of the fisherman in his boat on the moonlit stream, like the one in Ma Yuan's "voiceless poem," as they called a picture in Cathay.

"Come," urged the Venetians, "you surely must have seen the monsters that the sailors tell of, those

that have feet of an ox, face of a dog, and head of a man."

Marco shook his head.

"And others have told us of an obliging kind of fish that casts itself on shore, allowing the people to fill their nets for three days. And tell us, Signor Polo,



THE KNOWN WORLD AFTER MARCO POLO'S TRAVELS

is it true that in parts of China the custom is for children to kill their parents?"

Ah, no; it was just there in the Flowery Kingdom of China that children were taught by the great teacher, Confucius, to revere their parents and to help their neighbours.

"It is a good land," thought Marco with a sigh, recalling the picturesque houses and delicate structures so different from the massive buildings of Venice.

"But I don't understand," some one said. "Where

are all the wonders of the East? You will tell us, I suppose, that there is no country where men never grow old; and there is no sea, where during a storm, the sailors sew themselves in bulls' hides, plunge into the water, and are carried ashore by vast eagles?"

"No," said Marco, "I have not seen those marvels. But if you would hear of a wonder I have seen with my own eyes, listen.

"Imagine a vast palace of marble, whose halls and chambers are all gilt. Surrounding it is a park of rich meadows and forest, much greater than the entire city of Venice! In the centre of the grounds is a beautiful grove of trees. There the Khan built a royal pavilion supported by gilt pillars.

"Round each pillar," continued Marco, "a gilt dragon entwines its tail, while its head supports the roof." He went on to tell of the millions of people Europe knew nothing about, the millions of jewels, the millions of ships, the millions of towns——

"Marco Millions," the Venetians playfully called him. Marco not only told about all that he had seen, but he later wrote down all about his travels in *The Book of Ser Marco Polo.*

In this great book of his travels, Marco Polo described Chandu—also called Xanadu. Hundreds of years after that, Samuel Taylor Coleridge read of the fairy-land of Xanadu in a book named Purchas's *Pilgrimes*, and was so charmed by it that he wrote his famous lines beginning:

In Xanadu did Kublai Khan
A stately pleasure-dome decree:
Where Alph, the sacred river, ran
Through caverns measureless to man
Down to a sunless sea.

The great stores of knowledge in Marco Polo's book have profited the merchants of Europe enormously. At first his stories were not believed. His name came to typify a falsehood. Instead of saying, "It is a lie," people said, "It is a Marco Polo." But as the scholars pondered over his work, there was nothing else for them to do but bring out their map of the world and change it to fit the facts the Venetian reported. For Marco Polo was the first—the very first—to trace a route across the whole of Asia, describing the nations along the route. He was the first to reveal China in all its vastness and wealth, and in its Oriental splendour.

CHRISTOPHER COLUMBUS

ON THE WAY TO CATHAY

Over the route opened by Marco Polo the merchants of Europe hauled their goods to China. Peking and Hangchow became familiar names on the map, and the way stations Samarkand and Tabriz. Suddenly the way was blocked by the hostile Turk, and the merchants of Europe found themselves cut off from the wealth of the East. What could they do? Learned men said: "The earth is round. We can reach the East by sailing west." That is how Christopher Columbus came to lead the way to America. He was not the first; five hundred years before him, the Viking Eric the Red had landed in America. That is a good story, or saga, as his countrymen call it.

LET us tune in on it. Imagine a remarkable radio set, whose dials are as magical as a wizard's wand. In the cabinet frame is a television glass; it will bring the story-teller and his audience into our room. The programme is broadcast from a far station, but our short-wave outfit will bring it in clearly. Better still, this radio can pick up sound of long ago. Waves in the ether, it seems, never really die.

The story comes to us from Norway in the year 1050. Are you ready? Since you do not understand the old Norse tongue, I shall translate the old tale into English.

Look! The ocean rolls on the glass plate. Parts of the map skim over it. Those two blobs rushing by are the British Isles. Don't the waters of the North Sea look angry? Those floating chunks are chips of some iceberg. See, now, that shore-line shaped like

a dragon's head. That is the Scandinavian peninsula. We shall stop and focus on the western end, Norway. As the picture enlarges and the centuries drop away, 1900, 1800, 1700—to the year 1050, observe the fringe of islands. They look as though bits of the coast had broken off all along the edge, each threaded to the mainland by a fjord.

A sombre landscape is before us. We are following a road leading from the shore straight into a sort of yard. The broad gables of a building are on view, a stone wall, a doorway—and we go inside.

What a gloomy room! A line of flame is shooting up along the centre of the floor. That's the fireplace, the smoke from which drifts out through holes in the roof. We have dropped in, it seems, on a Viking feast. On benches, which line both sides, sit the men, their faces heavy with moustaches. The dais at the end of the hall is reserved for the women, tall beauties all. To one side, on a raised seat is the chief; opposite him, the poet hired to entertain his guests with a saga. He begins.

Lo! in the year 1000, there was much talk of exploration. Leif, the son of Eric the Red, hearing the call of strange places, bought a ship.

"I am the lucky one of my family!" he said.

So Leif the Lucky made ready his ship, filled it with thirty-five men, and put to sea. The fair wind died down, and the fog crept out of the north, and for days they drifted and knew not whither. By the luck of Leif, the sun came out at last, drove away the fog, and they got their bearings. Hoisting sail, they rushed their ship south. They had not gone many days when they sighted land. But it seemed a worthless country,

for it sprouted no grass. In the distance glistened high glaciers, and between the sea and the glaciers, the land was flat rock.

"Now I will give this country a name," said Leif. "I will call it 'The Land of Flat Stone.'"

And they sailed on. Not many days later they came upon a second landfall. They turned their prow shoreward, cast anchor, lowered the boat and went on shore. The land was low-lying and wooded. Everywhere stretched wide beaches of white sand.

"Now," said Leif, "let us call this 'Woodland.'"

And they returned to their ship at once. For two days they sailed south in the open sea. The wind was still at their backs when "land" again sang out. It was an island this time, to the south of which lay the mainland. The weather being fine, they landed on the island and looked round. The grass was sweeter than any grass they had ever known. They lingered and explored the sound between the island and the cape of the mainland. So eager were they to get to the mainland that, even though the tide was low, they attempted to make a landing. The ship ran aground, but they would not wait for the tide, and rushed ashore. Later, when the tide rose under the ship, they brought it to the land, and found themselves at the mouth of a river. Into it they steered and, with wooded shores at either hand, followed the river until it opened into a lake.

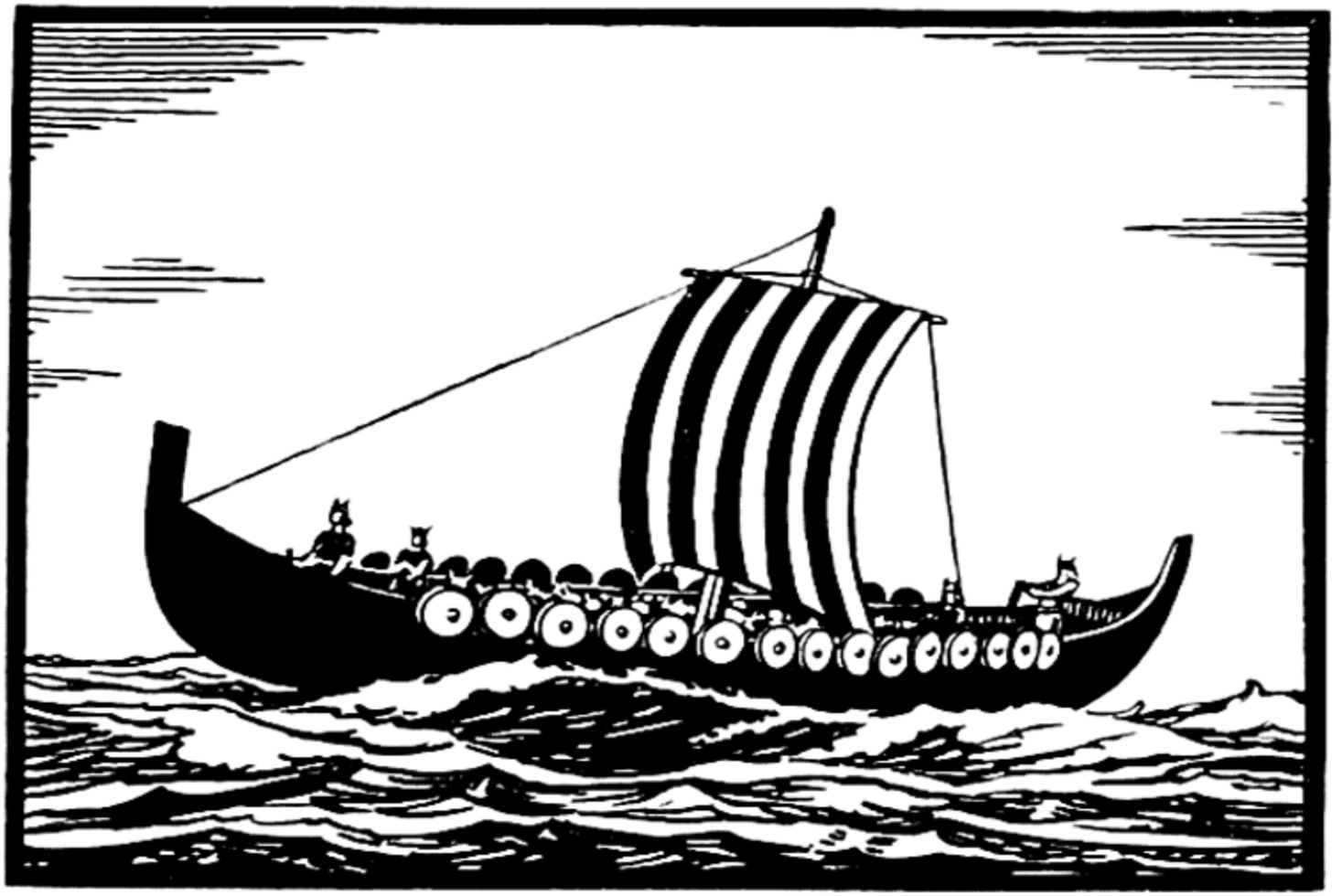
Leif was enchanted. "A good country," he said. "Here will we pass the winter."

So the men carried their leather kit-bags ashore and began to build large houses, and scurry about in search of food. Leif was rapt with wonder.

"This country would make a fine home for our

people," he declared. "Our cattle would not need fodder in the winter, for there seems to be no frost to wither the grass. And day and night are more nearly equal than in Iceland or Greenland."

When they had finished building houses, Leif said to his men, "Now I will divide our group in half. One



LEIF THE LUCKY PUT TO SEA

part shall stay home working at camp; the other shall spend their time exploring the country. Only they must return to camp every evening."

There was a good leader! Sometimes he went out with the explorers, other times he at stayed home.

One evening, when the explorers had come back to camp, it was found that Tyrker the German was missing. Leif was in distress, for Tyrker had long served his father, Eric the Red, and from his childhood

Leif had been fond of him. He turned in wrath upon his men.

"This is your fault," he scolded. "Come with me to look for old Tyrker."

When the searching party had gone a little way out, lo, there was Tyrker, happy and well, his small eyes dancing. Leif was overjoyed.

"Why are you so late, foster-father?" he greeted. "Why did you part from your fellows?"

Tyrker rolled his eyes and began to jabber in the speech of the Germans. No one understood him. When he at last changed into our Norse speech, he said, "I have found something new."

"Tell us," ordered Leif.

"I have found vines and grapes."

"Is that true, foster-father?"

"Surely it is true," said Tyrker. "Where I was born vines and grapes grew a-plenty."

"Wineland!" cried Leif. "We will call the country 'Wineland.' And we will gather a cargo of grapes and vines and felled wood to take back with us in the spring."

So Leif the Lucky gained both wealth and honour. He was a good chief!

The poet pauses to take from the gracious hand of his hostess a horn of mead. Let us bid him "skaal" and farewell, and tune him out. We leave his audience as excited as we are when we hear of a transatlantic flight to-day. They believe his every word about Leif the Lucky. The story, in fact, is familiar to them. They have heard their fathers tell it, but they enjoy it the more to hear it from the lips of a poet.

For as far back as ran the memory of his race, the Norseman had been a daring adventurer. The sea had been his domain, and in the frozen mists of the northern seas he had been as much at home as another was in the woodland. Leif's father, Eric the Red, standing at the high prow of his open vessel, had once landed in Iceland. Still sailing to the unknown west, he had discovered Greenland.

In Leif's veins flowed the blood of the Norse sea-rovers. The hull in which he crossed the sea was but one hundred feet long, and open to the weather. It had one mast hung with a square sail. When that failed to carry him, his thirty-five men could pull on their oars. He reckoned his course by the sun by day and the pole star by night. Those were his only instruments of navigation. When the fog blotted the skies, or a heavy gale seized the ship—all in the day's work of a Norseman—they drifted and tossed like a nutshell. In this way, Leif the Lucky, or Leif the Reckless, came to——

But where? Well, he sailed past Iceland, past Greenland. Those lands he knew. Then he must have come to the North American continent.

"In the distance glistened high glaciers," recited the saga-teller on Leif's first landfall.

Maybe they were not glaciers, but snowy hills. We guess that the "Land of the Flat Stone" is Labrador. Or was it Newfoundland?

About his second landfall, the poet said, "The land was low-lying and wooded. Everywhere stretched wide beaches of white sand."

That describes any number of spots from Nova Scotia down the coast. It describes Wineland, where the grapes made Tyrker the German so happy.

Wherever he landed, however, Leif the Norseman, with thirty-five men in an open boat, came to America about the year 1000.

II

But they say that in 1492 Columbus discovered America. So he did—in a way. Leif and his people had come to America, looked about curiously, had gone home and forgotten it. Almost five hundred years passed. Down along the coast of Europe, no one knew what Leif had discovered; not even the handsome stranger at Lisbon. And he, people said, knew all about ships and distant places. On the quayside the sailors remarked that he had even been to Iceland. That was not possible, others maintained. He had, however, gone down the African coast; had helped in fights against pirates. His tall, muscular frame was witness to this. It was said that once in such a fight, both vessels had gone down in flames and the crews had jumped from the burning boards. He had seized a floating oar and—mark his endurance!—had swum two leagues to shore. And yet, commented some, he had rather the eyes of a student, grey and still, and the dignity of a gentleman.

His name was Christopher Columbus. He earned his living making maps. To every known place on the globe he had been carried by the sails of thought. Over his lines of latitude and longitude, lands took shape and seas names. The spirits of Strabo and Ptolemy and the footsore Marco Polo guided him in his work. When he laid down his pen, he would look long at his map and wonder:

"Is this picture true? Surely that bulk of the Atlantic, from Madeira westward to the coast of Asia,

that is not empty. At least there must be more islands, perhaps large ones."

He said it to Pedro Correo, a shrewd seaman and the governor of the island of Porto Santo where Columbus stayed a while. The two friends talked much of ships and sea routes. Christopher, resting his eyes on the rim of the sea, grew reflective.

"But where, and who knows?" Pedro shrugged.

"Listen, Pedro. Those old legends of mysterious islands, are they nothing but fancies for children? The sunken Atlantis, Avalon, the Isles of the Blessed."

"Fables," said the hard-headed sailor. "You are a poet, Christopher. But sails are only sheets, and ships but boards, and the sea has graves for reckless dreamers."

Columbus could be hard-headed, too. "Fifty years ago," he argued, "who knew of Porto Santo, of Madeira? Yet there they were, waiting for the sailor with enough courage to sail far enough west. Well, there must be other islands farther out. And beyond," his mind leaped, "India."

Pedro smiled. "That is good poetry," he insisted.

"No, that is science. You agree that the earth is a globe. Strabo says that this Atlantic Ocean before us is the same that washes the shores of India."

"Even so," objected Pedro. "But it is not possible to sail so far, is it? Who knows the navigable route? Who has the hardihood to try it?"

"I," said Columbus.

Pedro was sympathetic. With Columbus, he believed that there was unknown land to the west. He knew of driftwood, carved reeds, huge bamboos, and dead bodies with strange, broad faces brought to his shores by the western tide. "The man," he said, "who

discovers the sailing route to India, will be the most famous among us."

All Europe felt like that. Merchants talked wistfully of the wealth of India and its trade. Once they had had a taste of it. Now, however, the land route over Asia was blocked by the hostile Moslems. Unless a sea route were found, the trade of the Indies—its spices and gems and silks—was lost. Map-makers hunted through old charts and travellers' yarns for a hidden waterway to India. Braggarts among sailors assured the land-lubber that "Some day, you wait and see——" In the council chamber of kings was debated the way to India. Yes, the man who found it would be immortal. When would he appear? From what quarter? The European coast from Italy to England swarmed with people whose soul was the sea, its salt in their blood; who were as comfortable in mid-ocean as gulls.

Daily they ventured farther out on the sea. Which one of them would first anchor a vessel on India's shores?

"I," said Columbus simply. He had faith in himself. But he was poor. To buy vessels and hire men he must induce some princely person to share his faith. That ought not to be difficult. Somewhere in Europe there must be a nobleman to back him financially. To find that nobleman, Columbus set forth. He was young, still in his thirties. Perhaps to-morrow he would have his ships ready.

To-morrow came, rows of to-morrows. A year, another year. Columbus was in his forties. Only the hopes of the wanderer stayed young. Noblemen he met, but none with vision. From Portugal he went to Spain, from Spain to Italy, then back to the courts of Spain.

"I have a world to give away," he would say. "The wealth of the Indies to boot. All I need is ships."

Noblemen listened respectfully. The dignity of the map-maker, his faith and knowledge commanded attention. But the risk was too great. The price of the dream was hard money. Columbus must offer it elsewhere, must wait. Meanwhile the stock of hopes which he had fed his vision for almost twenty years was dwindling.

One day in the spring of 1492, the Spanish court was sitting at Granada. The ancient Moorish streets rang with the tramp of soldiers, and the air flashed with arms and trumpets. In the court, minstrels were singing songs of victory. The Moor had surrendered, and Spain was at last entirely the dominion of Ferdinand and Isabella. The court was crowded with those of high rank in Spain.

In a corner of the room, sat a man who, despite his white hair, seemed to the courtiers to be only in his fifties. His tall, powerful frame and his ruddy complexion marked him as a man of the open air. His steady eyes and grave mien were emblems of authority.

"That is a certain Christopher Columbus," the courtiers might have said to an inquirer. "A map-maker. He hopes the court will send him out as an explorer."

In the general jubilee over the conquest of Granada, Columbus did not join. He seemed to say, "How can you be so elated over such small things, and neglect my offering of a new world?"

"Look at him," one sneered. "How inflated he is with idle thoughts of discovering a new world."

"What think the King and Queen?"

"Oh, they will never consent to his terms. Just

fancy! The beggar asks that he be made an admiral. Not content with that, he would become viceroy of all discovered lands, and share in the profit derived from them."

"But where is this new world?"

"In the West. He proposes to sail west until he comes to India. He maintains that the way is strewn with islands on which he can plant the flag of Spain. Such is his confident belief. But his tone is too lofty. The King and Queen will never be drawn into the adventure."

Columbus, waiting to be summoned before their Royal Highnesses, did not know whether they would consent to his terms. He himself, he had determined, would consent to no other.

III

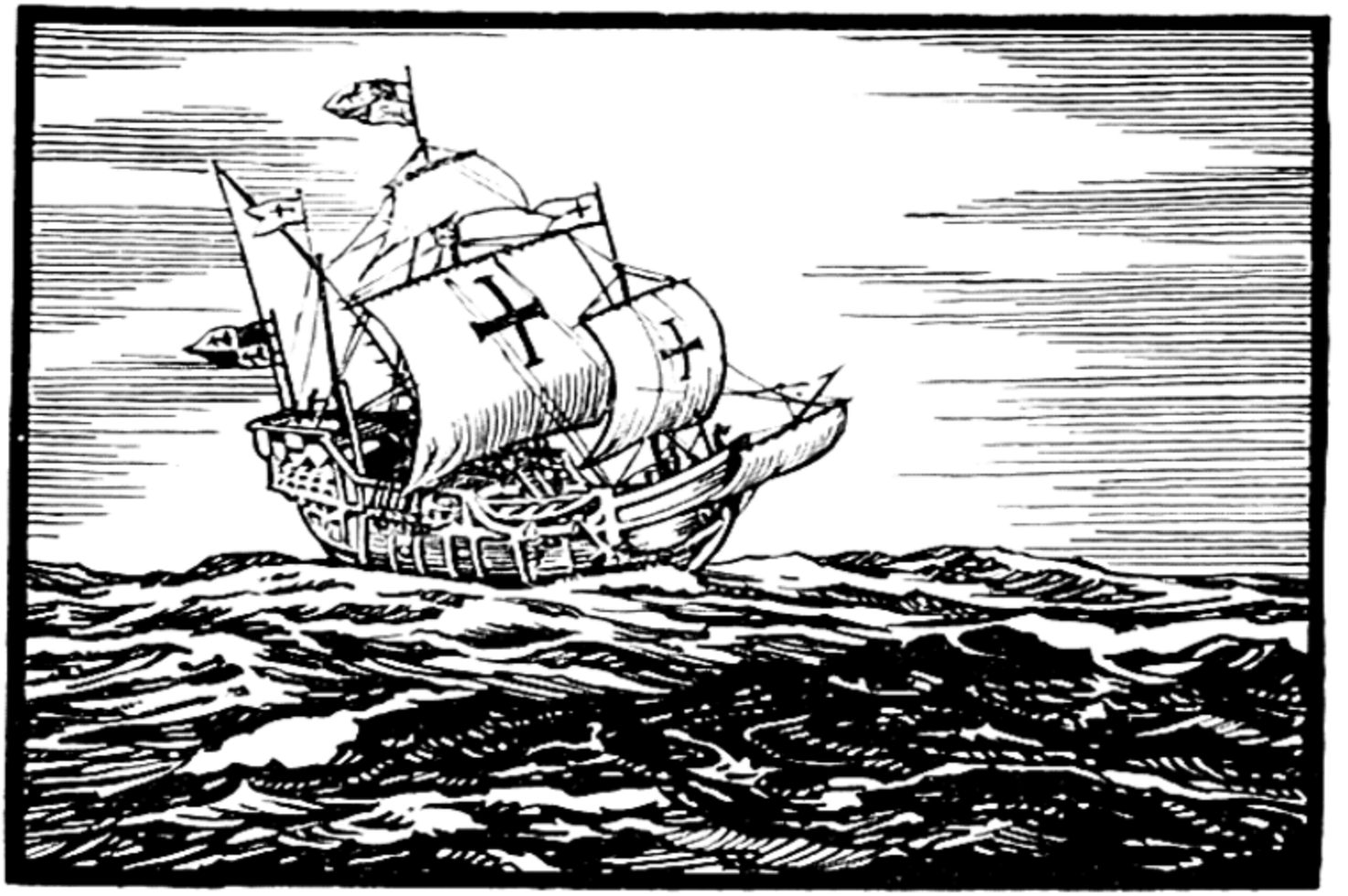
In 1492 Columbus, then, did come to America, as Leif Ericsson had five hundred years before him.

In a way, yes. But wait——

The sun rose over the sea-port of Palos in Spain, August 3, 1492, revealing three sails. Two of the vessels were light barks called caravels, open in the middle, with forecastles and cabins at both ends. The largest of the three was less than one hundred feet long, with three masts and a bowsprit. That was the *Santa Maria*, which carried the Admiral Columbus and his vision of a new world. But as the sails began tugging, farewells from shore sounded as though they thought that he would never reach a new world.

The map in the admiral's hand was more cheering. It showed the coast of the old world from Ireland to Guinea in Africa. Facing it, on the other side of the

Atlantic, the Admiral had drawn the outline of India and between them he had put the island of Japan. He was satisfied. When the fleet was forced to stop for repairs at the Canary Islands, however, he chafed impatiently at the delay. At last, when on September the ninth he ordered the anchors to be drawn up, he



THE *SANTA MARIA*, FLAGSHIP OF COLUMBUS

faced the horizon confident that Japan or India was the next stop.

His men, however, were dejected. Behind them was life and dear ones; ahead the perils of the unknown. They listened silently to the buoyant speech of their commander, spreading before them the gems and gorgeous stuffs of India. With fearful eyes they stared at the yawning water, at one another.

One morning their fears seemed to be confirmed.

The compass needle was behaving strangely. Instead of pointing to the north star, as they had always believed the needle to do, it kept shuffling to the north-west.

"An ill omen," whispered the crew.

As the sails pulled them farther into the waters of mystery, the needle swung farther away from its fixed point.

"We were warned about this," the men thought in terror. "We are rushing into a fantastic region where even the laws of nature do not hold."

No one could blame them for the fears. No one had ever heard of this phenomenon.

"Not at all," said Columbus. "The needle is behaving as nature meant it to behave."

The men grew calmer. Suddenly one of them called, "Look!"

Two birds were hovering on the waves, a heron and a water wagtail. The men knew that these birds never ventured far out to sea.

"Land must be close by," sang the crew.

The water grew tranquil, the sky clear, a soft breeze filled out the sails, and joy the spirits of the men. During the next few days, more evidence of land appeared. Patches of herbs and weeds washed up to the hulls of the fleet. Birds came singing over the masts. Land was close by, of course. Each ship gaily strove to take the lead, because the throne of Spain had promised a pension to the man who first sighted land.

But one day their hopes sank to the bottom. The promise of land faded like a mirage. The breeze died. The waters became dense with weeds, like a vast sunken meadow.

"A Sargasso Sea." The peril of death rose up again.

As the vessels laboured through the watery meadow, the men recalled the fable of a frozen ocean in which ships became locked immovably. They recalled the fable of Atlantis, the sunken island.

"The water is growing shallower," spoke Fear. "Far from human help, you will end by rotting on the shoals, the quicksands, the hidden rocks of this trap."

No words of Columbus could dispel the horror hanging over his men. He plumbed the sea, and proved that they could not touch bottom. For days after they had pushed out of the Sargasso Sea, the surface was as smooth as glass. But fear would not be allayed. The alarm spread. Columbus reasoned with the crew at great length.

"We dare not proceed," they insisted. "Turn back."

Columbus appealed to their sense of shame.

"Turn back," said the men mutinously. Groups of them gathered together and, in whispers, that grew hoarser each day, referred to the admiral as a madman leading a pack of fools not to the new but to the 'other' world. For Columbus, the alternative was presented: land or mutiny.

On October 7, he spied a flock of small birds flying towards the south-west. On the morrow, more birds —still bound south-west. A heron appeared, a pelican, even a duck, all moving in the same direction. His hopes leaped. "Steer south-west," he ordered the pilots.

"Turn back," demanded the crew.

"Look, my men. Look at the flotsam on the water." A patch of fresh river weeds bobbed up, a twig of berries, a reed. But what completely dissolved mutiny and terror was the sight of a board and a carved staff. Not only land but inhabited land seemed sure to lie

just over the horizon. Every man was as tense as a mast.

On the night of October 11, Columbus stood on the high poop of the *Santa Maria*. His eye swept the dusky waters. Faintly he heard the lapping of the water at the sides of the ship. He felt the soft swirl of air about his face. In the gloom he could barely make out the sails of his two caravels. But there on the line of the horizon, he thought he saw—or was it his beating brain?—the glimmer of a flame. The gleam faded. No, it reappeared.

"Pedro," he called. Pedro stepped to his side. "What do you see, Pedro? There!"

It was a torchlight and no mistake. A gun boomed. One of the other ships announced the discovery.

From then on, waiting for dawn seemed to Columbus an eternity. Land at last! But what land? Was it a wild island in the Indian Ocean, the spicy groves of the Orient, Japan, India?

"Land ho!" The new world dawned Friday morning, October 12, 1492.

Then Christopher Columbus did discover America in 1492? Oh, not counting Leif Ericsson five hundred years before him!

Well, in a way, Columbus never knew what he discovered. To his dying day he believed he had landed on the outlying islands of India. He sprang on shore, named the island "San Salvador," and pronounced the bewildered natives "Indians." He wandered among the Bahamas, touched Cuba, and kept looking for signs of Oriental splendour. Finally he went back to Spain without touching America. He made four voyages backward and forward. Only on the third did he

behold the mainland, but that was not until 1498. Even then he protested that it was but an island, beyond which lay India.

He was a bold, a great man. He discovered the sailing route to America. He predicted he would find islands, and he did. He proved the possibility of so long a voyage, encouraging others to follow his example. We mean all of that when we say, "In 1492, Columbus discovered America."

VASCO DA GAMA

INDIA AT LAST

America blocked the western route to Asia. There was, however, another road to India, the road by sea round Africa. If that failed, the wealth of India was lost to the Europeans. Meanwhile Portuguese ships were edging farther and farther down the coast of Africa; nearer and nearer to India. It was all the work of Prince Henry. The story of how India was reached at last begins with him.

IN the audience chamber of the King of Portugal, young Prince Henry was pacing backward and forward. The stone floor rang smartly; the prince's usual dignity was ruffled.

"Patience, my son," counselled King John. "The prior will soon be here."

Just then a lackey announced, "The Prior of the Hospitallers," and an elderly gentleman, dressed in the robes of the Order of the Knights Hospitallers entered. Cordially all greeted the prior, and questioned him anxiously about the secret journey he had just made. The prior smiled.

"What have you found?" asked the impatient Prince Henry.

"Sire," the prior replied slowly, "I prefer not to speak of what I have found and seen until I have two sacks of sand."

"Two sacks of sand!" the amazed Prince exclaimed.

"Two sacks of sand," repeated the prior, "a reel of ribbon, and half a bushel of beans."

"Are you a wizard," laughed the King, "and are we to have some magic ceremony?"

The prior gravely bowed.

"I would not dare jest with your Majesty," he solemnly replied, "but I would beg to repeat my request."

The peers of the realm laughed again.

"Hear how he answers!" said King John, turning to his sons. "I sent him to spy out the town of Ceuta. When now I ask for an account of his journey, he replies by calling for sand and beans."

Nevertheless the good King John commanded that the prior's wish be fulfilled.

"I would request that your Majesty give me a room where I can spread these articles on the floor."

"Stranger and stranger!" muttered Prince Henry.

The sand, ribbon, and beans were accordingly placed in an adjoining chamber. Saying he would call them in a short while, the prior retired.

"The good prior must have been studying the black arts," ventured Prince Peter.

"Why does he make a mystery of this?" Prince Henry demanded. "We sent him to bring us an exact description of Ceuta and its harbour. It seems to have affected his mind."

"The prior is a very wise and aged counsellor," the King suggested. "Perhaps he knows a better way to describe Ceuta than by words. Although I am just as curious as any of you, let us be patient."

While he was still speaking, the door opened and the prior appeared. "Now, your Majesty," he said, "the result of my labours can be seen. Your very eyes shall behold the town of Ceuta, and you can answer your own questions."

He stood respectfully aside, while the King and the three princes eagerly entered the room.

On the stone floor they saw moulded in sand a large

map of the Strait of Gibraltar. They could trace the southern coast of Spain with its mountains, and on the other side of the Strait the headland of Ceuta extending into the sea.

The beans were arranged in rows, like the streets of the city. A piece of ribbon showed the contour of the walls. The beach and landing-places were indicated by sand.

"An excellent way of describing a place," marvelled the King. "With this plan, I think I could go about the city without getting lost."

While the others were admiring the map, Prince Henry was deep in thought. "If a town with its harbour can thus be shown," he mused, "why not a whole country? I think I can make a map of Portugal; indeed, one of the world."

Walking into the garden, he resolved, "I shall do it. But I must know more about the world. To the south of us is Africa with its mysteries, and to the east is India. What do I know for certain about these?" Prince Henry stopped to kick aside some gravel. "I shall send men to explore Africa and bring me the truth about that continent, and ships—whole fleets of them—to sail about Africa and perhaps reach India, the land of spice and silks. That is how I'll serve my country, Portugal, and the world."

II

Eighty-two years passed. From a small country, Prince Henry's expeditions along the coast of Africa had made Portugal into a great empire. From his lonely look-out on the tip of Cape St Vincent, Henry

the Navigator, as he was called, had launched his ships. One of his captains had discovered the island of Madeira; another had rounded Cape Bojador, never before reached by any European. Shortly after this, another vessel returned with the outline of the African coast down to Cape Blanco. Prince Henry had filled in his maps, and prepared another expedition.

"Perhaps this one," he had always hoped, "will find the way round Africa to India."

When his sailors had continued to return with yet more of Africa to report, the Prince, gazing towards the continent opposite his windows, wondered, "Is it endless? Does Africa reach to the South Pole?"

For fifty years he had hoped vainly that the ships would reach India.

One day, thirty years after Prince Henry's death, Dom Manuel, King of Portugal, was sitting in the throne-room of his palace. Round him were grouped his counsellors. They were discussing explorations.

First Counsellor: "Columbus has failed."

Second Counsellor: "He found a new and surprising country."

First Counsellor: "But it is not India. What wealth can he get from this new land? In India, however, we have heard there are silks and precious stones and spices, and——"

Second Counsellor: "But can we reach India? Where is it?"

First Counsellor: "That is not the question. The question is *who* can reach India. The great Prince Henry has shown us the way. Now who will follow? Marco Polo lifted the veil from China, and no less a man can reach India by sea."

Dom Manuel sat quietly thinking. As his counsellors so well put it, "Who can reach India?" Portugal boasted good mariners. But for this heroic and dangerous quest only a great one could serve. Who?

"Well," said one, "we have Diaz, who went to the Stormy Cape."

"You know I have forbidden the term 'Stormy Cape,'" interrupted Dom Manuel. "We must not discourage our mariners. Say 'Cape of Good Hope.'"

"Well, then, Diaz reached the Cape of Good Hope. That is sufficient proof of his great skill."

"But India is far beyond the Cape," broke in another. "Dom Manuel——"

The King was not listening. During the discussion a young man was crossing the spacious hall. He seemed to be a man in his thirties, tall, with black hair, black beard, and striking, fierce eyes.

"Who is that?" the King asked.

"A gentleman of your court, sire," answered a courtier.

"His name?"

"Oh, that is Vasco da Gama, Paulo's younger brother."

"He seems dashing. Is he as good a navigator as his brother?"

"He is very resolute and daring," said the counsellor. "The da Gamas have all been great navigators. But Vasco is young."

"All the better," responded the King. "He may be the braver for his youth. Call him here."

The young man approached. Dom Manuel regarded him fixedly.

"Vasco da Gama," said he slowly, "the man who will make neighbours of the great unknown people of

the Oriental lands of India and our peoples of the West—that man, Vasco da Gama, will win everlasting glory."

The young man knelt down. "Sire," said he, trembling with joy, "I would give my life to be that man."

The King rose to his feet. "Arise, Commander," he proclaimed, "and prepare your fleet."

That was how Vasco da Gama was chosen. Building his fleet of four ships and choosing his force of one hundred and seventy men was a task of much love and little time. While he made these preparations, moreover, he carefully studied his maps and charts and Ptolemy's *Geography*. Then, having read thoroughly *The Book of Ser Marco Polo*, as Columbus once did, he felt ready to unfurl his sails.

On a summer day he weighed anchor. A great throng, in solemn parade, marched with him in the blazing sun along the beach of Belem—a beach of tears. Finally, da Gama and his comrades took leave of the weeping multitude and rowed out to their four ships. The sails shot up a hundred feet in the air. The waves licked the sides of the ships.

"They will never come back," a mother wailed. "The great Sea of Darkness will swallow them all."

Every one knew that. Every one knew that when the frail ships tossed between sea and sky all the men would turn a strange colour. Every child whispered tales of sea monsters and sirens that preyed on rash adventurers. There was the sea unicorn waiting, whose horn could pierce three ships at a blow. Vast and menacing were the dreadful phantoms of the sea. And even if da Gama escaped them, there were sheets of flame and boiling waters. Attempting to cross the equator, the men would be shrivelled up by the sun.

Even the less superstitious shook their heads. The sirens and phantoms were small risks. The real danger lay in the attack of those fierce currents guarding the coast of Africa. Da Gama, of course, was a skilful navigator. He would perhaps stand far enough out to sea to skim the edge of the tangled tides. But then he would find himself in the grip of the gale that swept down from the north-east. The determined eyes of da Gama meant that he would never turn back. But how long could mere timber and canvas withstand a battering from the bottom of the ocean to the sky?

Added to these dangers must be those unknown to anyone. No one knew the sailing route. The whole venture was a long leap into the dark. In the quarter-deck castle, da Gama had maps and books. He had a copy of Ptolemy's works and much information about the East, for use when he got there. He had a compass which was not always trustworthy. Even if it were, would it console the men, as the fleet sank, to know where was north? Now and then the pilot would throw a chip over the side of the vessel, and with his sand-glass measure the time it took the chip to float by. That enabled the captain to answer roughly the bitter question of his men, "How far from home are we?"

With a glass of sand and a handful of chips Da Gama hoped to chart the route to India. No, he had one other mighty instrument—a disc of wood, known as an astrolabe. Every day at noon, three men would step out on deck holding the astrolabe. One would hold it as steadily as he could. Another would point its movable cross-piece at the sun. The third man would read the degrees it marked off on the edge of the disc. This information they would take to the captain and

with it he would roughly calculate the latitude they were in. Would that bring them nearer to India?

"They will never come back," mourned the watchers, as their eyes followed the dwindling sails. At the



VASCO DA GAMA USING THE ASTROLABE

edge of the sea, white specks slowly sank, trembled for a moment on the horizon, and vanished.

Silently, the crowd turned homeward.

III

Onward sailed the little fleet; towards the flaming waters and fabled monsters, perhaps. Day after day, week after week, stretched the dreary wastes of sea and sky. Vasco da Gama sat in his look-out. His fearless eyes betrayed no shadow of the anxiety he felt.

For months there had been no sign of the promised

land. The men were becoming uneasy and somewhat fearful.

"Perhaps we are following da Gama to our doom," some thought.

Da Gama knew, besides, what his men did not, that they were nearing the dreaded Cape of Good Hope. There they might all be wrecked by its everlasting storms. If only they could round the Cape, they might find India. But come what might, da Gama determined never to turn back, though he battled the storms to his death.

They passed by a broad bay which was not on his chart. "Let its name be 'St Helena Bay,'" said da Gama.

Winter was setting in, and as the fleet approached the Cape the waters grew rougher. Da Gama girded himself for a struggle. He prayed that all his men might be in good health and high spirits, his ships trim and sturdy.

Suddenly an unlooked-for misfortune visited them. A disease, feared by all sailors, broke out among the men—scurvy! The hands and feet of the crew swelled; their gums grew over their teeth, so that they could not eat; they lay sick and dying. The storm was on its way.

"Take us back," the dying men groaned.

Da Gama turned grimly away. He hid the pain he felt at his crew's suffering. He must go on to India where eternal glory awaited them.

The storm broke. Darkness came. The sea tossed the little fleet about as a monster does with its prey. Dark floods of rain beat the decks; lightning seemed to set the air on fire. The men despaired of life now, unless their commander turned back.

Da Gama knew well that their fears were just, but his will was iron. Life without glory meant nothing to him.

"Turn about! Take us back to Portugal!" clamoured the crew, as the cold rains beat upon their heads.

Da Gama faced them. "When we left Belem," he said, "I promised in my heart not to turn back a foot of the way. On!"

"Mercy," pleaded his officers.

"Away!"

A sailor came running up. "The water is rushing in through the keels," he gasped.

An officer approached. "We are running very low in provisions."

"Cut down the rations!"

All round death stared. The men no longer took heed of their lives. The sea lashed them from above and below. But a little while longer and the few brave souls who had dared the angry water of the Cape would have disappeared from the surface; the vast unconquered sea would have swallowed the frail ships like a wild animal swallowing four morsels of food. The ships pitched violently. The sailors could hardly keep their footing.

"Take courage!" shouted da Gama above the thundering din. "We are destined for glory. Even the sea trembles at us."

All at once through the black sky a ray of sun shone. The sea grew calm. The storm ceased. The ships sailed along peacefully. The men could hardly believe their senses.

"What is it?" they asked, rubbing their eyes at the miracle.

"We have reached the Cape," said da Gama.

The cry of "Land! Land!" arose. It was Mossel Bay, already discovered by their countryman, Diaz.

They sailed on without lingering. Da Gama could not rest until India was reached. He was now in seas no European had ever sailed before. On Christmas Day he found land, which he named "Natal." Past the island of Mozambique, past Mombasa, up to Malindi, they sailed. Here beckoned friendly white-washed houses, coco palms, hop gardens. And da Gama let his weary crew rest.

Down to the strand swarmed a host of cheerful people. Their purple caftans glittered in the sun. In hand they bore branches of the palm-tree. Presently, da Gama noticed gliding towards him a long barge, hung with varicoloured silk. It was the King, come to welcome the strangers. His musicians standing on the front of the barge blasted the soft air with their trumpet peals.

East and West exchanged greetings. The turban met the plumed cap; satin breeches the silk caftans; sandals the buckled shoes.

Da Gama was touched by the hospitality of the old King, and presented him with a sword in a gold scabbard, a lance, and a buckler. To these warlike tokens, the King responded gently by sending provisions to the ships, by swearing eternal peace with his new brother, the King of Portugal. The manners of the East differed from those of the West.

It was tempting to sport in this sunny spot of Africa, but da Gama was impatient. Regretfully the crews set sail again. Again the vast sea and boundless sky. A week went by. Another week. Another week.

Then the tired watch blinked his eyes and saw something.

"Land," he bellowed.

The whole crew rushed on deck. The dim form of mountains, like shadows, rose up from the sea. Da Gama gazed.

"India!" he cried exultingly.

IV

The longest journey ever made on the sea up to that time was over. Eleven months after he had sailed from Belem, Vasco da Gama reached Calicut, India.



VASCO DA GAMA DISCOVERS THE SEA ROUTE TO INDIA

To da Gama, whose nerves were taut with months of anxiety, Calicut was refreshingly alive. In its harbour was crowded every kind of Oriental craft: Chinese junk, Arab schooner, native scow—hull touching hull. And the port itself was bewildering in its

activity. It was a mart for all manner of trade. And this, above all, overjoyed the Europeans. For spices, drugs, and precious stones, they risked their lives. Not in vain, it seemed. The air of Calicut was heavy with spices; the neck of every beggar appeared to be hung with pearls.

"Peace be with you!" muttered a crouched form. "Give alms, for the charitable man is loved by all. Give alms!"

Over there a throng was gaping at the miracles of a fakir. Jewels flashed from tawny skins. Some men wore long hair and flowing beards; others curved moustaches and shaved heads. The women wore golden necklaces, and their bare toes sparkled with rings set with precious stones. The fakir was caked with dirt, and a human skull hung at his girdle.

"He eats live coals or glass," da Gama was told. "He has the powers of a magician. They say he can conjure up a rope from the thin air, climb up, and disappear into the clouds."

Yonder, a row of merchants' stalls.

"Fish! Boiled fish! Best in Calicut."

"Buy your cloth here!" The Europeans called the calicut cloth 'calico.'

"Figs! Fig leaves! Coconuts!"

"Boiled rice! Delicious rice! Ah!" The vendor bit into a coin that a customer handed him.

A dervish was shouting his lesson at the merchants in the stalls, "By the fig and the olive, the desire of making money keeps you busy until the grave! Later, you will realize your folly——"

Da Gama came upon a story-teller, seated on the ground, his legs tucked under him, stroking his long black beard and droning, "——lo, the earth trembled,

and from the upper air descended upon Sindbad a person of enormous size, like a great palm-tree. His eyes were two blazes of fire, and he had tusks like the tusks of swine, and lips like the lips of a camel, and the nails of his hands——"

To the court of the ruler went da Gama. The Rajah, as he was called, was lying on a green velvet couch under a gilt canopy. A small man he was, with a dark beard. From the waist up, he was naked, and his dark skin fairly flashed with ornaments. On his left arm he wore a bracelet. Round his neck hung a string of pearls, each pearl surely the size of a hazel nut. Above the necklace, somehow, ran a gold band studded with even larger pearls and rubies. His long hair, tied in a knot, gleamed with pearls and emeralds, and his ears were tipped with beads. Da Gama was dazzled.

Alongside the Rajah was his chief Brahman, or priest. Da Gama knew that the Brahmans were the most learned men in the land. They were the authorities on right and wrong. The Rajah consulted them constantly. This Brahman da Gama already knew, because he had brought him a message from the Rajah. The message had been inscribed with an iron stylus on a dry palm leaf. Da Gama had seen the Rajah's clerks and writers, the stylus in their hands and a bundle of palm leaves under their arms.

At that moment the Brahman by the side of the Rajah was not engaged in matters of learning. He was busy handing from time to time a green, folded leaf to the Rajah. This leaf the Rajah chewed constantly. His mouth and teeth were stained red with it.

The Rajah listened courteously to the sturdy sea captain's tale—how for sixty years the Portuguese had been struggling to find a way to India.

"My soothsayers," said the Rajah, "have warned me that some day India will be ruled by a prince of the West. Nevertheless, you are welcome. King Manuel is my brother, and all the Europeans are our brothers. This is a lucky day for you. Our country holds great riches. Spices and precious stones will be our gift to you."

"And to you, O Rajah," replied da Gama, "we shall bring gold and silver, corals and scarlet cloth."

Three months da Gama stayed in India, and then back he went to Portugal with his great news. He knew he had discovered the ocean way to India. But he did not know that he had changed human history.

After two years the people of Portugal had despaired of ever again seeing the fleet of adventurers. And now the four ships dotted the horizon of Belem once more. What if of one hundred and seventy men only fifty-five returned?

Dom Manuel could not do enough to express his gratitude. Vasco da Gama was made one of his greatest noblemen. He was now Dom Vasco and Admiral of the Portuguese possessions in India. The greatest Portuguese poet of the time, de Camoëns, celebrated the life of the greatest Portuguese hero in his famous epic poem, *The Lusiads*. Never had a brave man so enriched the history of the world as did Vasco da Gama by uniting the East and West.

FERDINAND MAGELLAN

ROUND THE WORLD

At this time in the history of the world most exploration was done by the Portuguese and the Spaniards. In 1493 the Kings of Portugal and Spain made an agreement. On their maps they drew a line running north and south, one hundred leagues west of the Azores. They agreed that all territory east of that line was for the Portuguese to explore, and west of it for the Spaniards. Spain, therefore, could not use Vasco da Gama's eastern route to India. She sent her men—Cortez, Pizarro, Balboa, Ponce de León—to America. Juan Bermudez discovered the islands called in his honour "The Bermudas." Amerigo Vespucci wrote so much about the New World that it was called "America." Still, all this did not console Spain for being deprived of the wealth of those islands lying in eastern waters, especially the Moluccas. But how could Spanish ships reach the Moluccas without violating their agreement with Portugal? To answer this riddle, there stepped forward one of the most gallant navigators of all time.

FERDINAND MAGELLAN, Portuguese sea-captain and adventurer, received a letter from his friend, Francisco Serrano. Magellan had left Serrano prowling round somewhere in the Indian Ocean, while he himself had sailed back to Lisbon.

"I have discovered," said the letter, "a new world, larger and richer than that found by Vasco da Gama, the Spice Islands! I shall remain here, for the native king has made me his captain-general." Many strange tales had reached Portugal about the Spice Islands. There were supposed to live men with spurs on their ankles, hogs with horns, hens that laid their eggs nine

feet underground. It was said to be a land of boiling rivers, poisonous crabs, giant oysters, and pearls as large as rocks. One thing the islands certainly had—tons of spices.

Magellan went to Charles V, King of Spain.

"Fit me out a fleet," he offered, "and the Spice Islands are yours."

Like Columbus, he explained, he would sail west. On the other side of South America stretched a new ocean which Balboa had seen a few years before. There must be a strait, maintained Magellan, cleaving through the continent to this ocean.

"And westward on this ocean must be the Spice Islands and my friend, Francisco."

He wanted as much to see Francisco as to blaze the westward way across the world. They had been shipmates together, had starved and made merry together. Magellan would risk his life to go to his bosom friend.

King Charles was willing that Magellan should strike out to the Spice Islands by this new way, if he could muster a crew. But who was foolhardy enough to throw his life away? Brave men were not easy to find.

Magellan himself did not think twice about the danger. His heroism was famous. Everybody knew how he had once saved the lives of an entire crew, and how he seemed to have small care for his own skin.

From here and from there, at length, a crew was chosen, nearly three hundred men, all sizes, shapes, and nationalities. Five old ships there were, with ribs that were said to be as soft as butter.

"A week at sea," people warned Magellan, "and the rotten boards will split asunder and leave you drowning like rats."

Magellan listened politely, thanked them all for the

sound advice, and went about his business firmly. One of his ships was called *Victoria*—Victory. This was the motto he would wave round the world.

II

From the south-west tip of Europe to the north-east tip of South America more than three thousand miles of lashing waters intervene. For ten weary weeks, Magellan stood by his masts, looking out to sea. Behind him tossed his fleet; before him stretched the endless waste. But on November 23, 1519, the hoarse cry "Land!" sounded above the noise of the sea. Through the mist, Magellan made out the solid shape of the Cape of St Augustine. It was high time.

Once more his feet felt the firm earth. But how different this earth, its inhabitants, its fruits! Somewhere in Spain stood castles, and there were dons with white skins who wore capes and beards, and peasants who ploughed the earth. Here he was greeted by almost naked dusky bodies with painted skins. What dress they wore was made of parrot feathers. The men had smooth faces, for they pulled out their beards. They pierced their lower lips, and in the holes stuck long stones. They left the work in the fields to the women, whom Magellan saw carrying their babies in a new kind of net slung from their necks.

Yet these Brazil Indians had warm hearts, and considered Magellan and his men their guests. They brought them gifts of parrots and small yellow monkeys and, for the comfort of their guests, built them a long wooden house. Their fervent hospitality touched Magellan, but after two weeks he bade his hosts farewell and turned his ships southward.

Colder and colder it grew, and fearfully stormy. The fleet tossed about helplessly in a gale so fierce that it blew all the forecastles away. Magellan saw that he could not go on. He must seek a harbour in which to take shelter for the winter. Suddenly a pleasant coast came into view, and towards it he steered.

At once a cry arose, "Back to Spain! Back to Spain!"

"No, my men," declared Magellan, "we shall not go back. Never until we have done what we set out to do—reach the Spice Islands. Here, in this new land, we stay until the ice thaws. Already we are farther south than any other navigator has sailed. Courage!"

"But where are we? The country seems uninhabited by man or beast!"

Even as the sailors said this, a strange and beautiful animal appeared on the slope. It was about four feet high, with a gracefully curved neck, and long, slender, legs. Above, its silky hair was fawn-coloured; below, pure white.

"What is it?" asked the wondering sailors. Europeans had never seen such an animal. Later they named it "guanaco."

The animal bounded away, and a human figure appeared on the slope. He stopped, stared at the strangers, and then, approaching, struck up an acquaintance with them. Presently he went to bring his people down. As he strode away some one whispered to Magellan, "Hasn't he enormous feet?"

He had. It was the country of big feet. "Patagones"—Big-feeters—Magellan called the inhabitants, and the name stuck.

To Magellan, the Patagonian was a rather curious sight. He towered well over six feet, and had enormous,

coarse features. Despite this very masculine appearance, the Patagonian used 'make-up.' His face was painted red all over, except for his eyelids. Those he painted yellow. On the middle of each cheek, he had drawn a heart. One would have thought that adornment could go no further. But the Patagonian



MAGELLAN'S SHIPS TOSSED ABOUT HELPLESSLY IN A GALE

was a determined artist, so he paid some attention to the hair on his head. That he painted white. Wondering whether he saw himself as others saw him, Magellan held up to him a steel mirror. The result was electric. When he saw his face, the Patagonian was so terrified that he jumped back, knocking over four men round him. To soothe his wounded feelings and to help him with his toilet, Magellan gave him the mirror, a comb, and some bells.

Treated so amiably, the native brought his friends round. They were a club of happy giants, these Patagonians, singing and dancing the day long, living on herbs and the flesh of the guanaco. But what an appetite! Magellan invited two of them for a snack, a mere nibble, that they might talk or make signs at each other about the straits the adventurer was seeking. That was a great mistake, and a calamity to the crew, who were running short of food. For, while Magellan munched two or three biscuits, the two guests ate a basketful, and daintily washed it down with half a bucket of water.

"We know nothing of any straits about here," the Patagonians signalled.

So, when the season grew milder, Magellan sailed away from Patagonia. He had not gone far south when suddenly they came upon a vast inlet. As they explored these new waters, it dawned on them that they were in the long-sought, far-away strait—the Strait of Magellan, as it is now known.

"Fortune is smiling now," thought Magellan, but his men were flinching.

"No one has ever sailed that ocean on the other side of this strait," they argued. "Who knows its perils, or its extent, or its course? Our provisions are low. We can go no farther. Let us turn back."

Magellan faced them. "My men," he said, "you are right. The voyage will be long and dangerous. Our provisions are wasted. But I believe that you are heroes, that the world will never forget you, if you succeed in your adventure. For myself, I would rather have to eat the leather on our ships' yards than turn back. Will you continue with me, or do you still want to return?"

"Oh, on! We will go on!" cheered the men. "We will sail with you to the other side of the globe!"

As they sailed westward through the strait, Magellan gave names to all the capes, bays, inlets, mountains, and harbours. To the south lay a land of mountains



WHILE MAGELLAN MUNCHED TWO OR THREE BISCUITS, THE TWO GUESTS ATE A BASKETFUL OF THEM

on whose tops were seen burning fires. "Tierra del Fuego"—Land of Fire—Magellan called it.

All at once before his hungry eyes lay the waters of the great ocean, seen by Balboa seven years before. With tears of joy and salutes from his cannon Magellan greeted it.

As the ship swung into the new ocean, the fierce winds died down, the heaving waters became peaceful.

Magellan was overjoyed at the change. "A pacific ocean!" he exclaimed.

His joy was short-lived; the food-supply was dwindling fast. The faces of the crew became pinched, their eyes watery. To add to the misery, scurvy broke out among the starved men. Weak with hunger, they offered no resistance to the terrible disease. By dozens the crew perished.

The survivors envied the dead. Food! It was a nightmare with them, Magellan included. There were no more meal-times.

"I would rather have to eat leather than turn back!" Magellan remembered these words. They had been prophetic. He ordered the crew to cut the hides from main yards and boil them. When they had no more leather they ate sawdust.

One morning the half-dead crew awoke to a strange sound on the water—human voices! They looked out, spellbound. There on the shining waters were swarms of canoes filled with brown men, holding aloft stalks of bananas and clusters of a strange nut and fruit. With a cry, the famished crew fell upon the food while their visitors looked on amazed.

In the distance Magellan saw one of the most beautiful sights in the world—island mountains. Forests rose up before him, of bamboos and palms. As he gazed, one of his officers ran up saying, "Those rascals have stolen our small boat!"

"Ah, we are among thieves," said Magellan. "Let us call these lands 'Ladrones'—the Robber Islands."

At one of these islands, Guam, he landed and refreshed his men, although he stayed but two days. The Spice Islands must be somewhere in these waters. He must be off to seek them. His bosom friend

Francisco awaited him there, and he longed to embrace him.

A week more on the sea and land loomed up. His heart leaped, but in a vain joy, for this new group of islands was not the Spice Islands at all. What were they? Magellan took out his map of the world, but he did not find them on it. So he sketched in his new discovery; and the Philippines became a part of the map. The islands were beautiful with palm trees and clear springs. "Here," thought Magellan, "I can help the sick among my crew to recover." With his own hands he proceeded to tend them.

For a whole day not a human being appeared on the horizon. Magellan was becoming curious when, from one of the neighbouring islands, a boat manned by nine natives pushed off. Were they friends? The doubt lasted only until the boat touched the shore of Magellan's camp. The native leader stepped forward with joyous greetings, and gifts were exchanged between the East and the West. Red caps, and bells, and looking-glasses were the gifts of the men of the West. The East was more practical. It supplied the famished adventurers with fish, bananas, and again the strange nutty fruit at which Magellan marvelled, for it was bread, milk, and oil all in one, he thought—the coco-nut!

"Come to dinner," invited his hosts cordially, in sign language.

Food was what most interested men who had just come through a starvation period.

"Since we were not prepared for your visit," gesticulated the native King, "you will have to do with our simple food."

The first course was an enormous portion of roast

SRP PRATAP COLLEGE LIBRARY,

pork. The service was entirely of gold—platters and cups of solid gold—and gold plaques and panels blazed brilliantly from the walls, dazzling the eyes and hearts of the Europeans. But on with the dinner! The main dish consisted of quantities of rice with spiced pork, sauce, and gravy. The beverages were especially delightful—a soothing drink prepared from the milk of the coco-nut, and a mild palm wine.

"This dinner was worth the trip," thought the adventurers, with satisfaction. "We won't want food for six months."

The next course consisted of a huge platter of roast fish and ginger. The Westerners began to feel alarmed. After all, the capacity of the human stomach is limited. But could a guest refuse? Taking heart, for they were brave men, they attacked the fish and by sheer courage disposed of it.

"The danger is past," they thought faintly.

But wait—the enemy was advancing with fresh power. Platters of fish and rice steamed in. Recklessly the Europeans fell upon the dish—and collapsed. So did the King of the islands. And they all snored away the effects of the food.

The King was a strange specimen to Magellan. "A savage!" thought the commander. "Look at him! Tawny in colour, his body painted and nearly naked; gold rings in his ears, gold studs in his teeth. He is short and fat, a lover of ease and quiet. Though he is a just man, he is also arrogant; nobody may speak to him except through a tube. His Royalty must not stoop; therefore, when he has occasion to enter a room with a low doorway, he has to go in by the way of the roof. He has queer manners. To show his affection, he shoots out his clenched fist at you."

But the native probably thought, "What strange people the Spaniards are! So parched-looking, and as skinny as skeletons! Why did they risk their lives to come here? Isn't their home comfortable? How impressed they were with our metal, gold! They seem to worship it. The worst of them is their uninteresting faces. There is no 'make-up' on them, no life—just the skin of an animal with no art on it to make it human. And their bodies they cover up with rags, as if they would shun the air and sunshine. Such queer customs, too. To show affection each squeezes the other's palm."

Magellan's longing for the Spice Islands—now called the "Moluccas"—and for his friend Francisco made him restless. It was time to leave the pleasant haunts of the Philippines.

III

One day about three years after Magellan left Spain the people of Seville saw a singular ship wearily making its way up the Guadalquivir. So battered was it that even the ghostly emblem it bore, "Victoria," failed to make it recognizable. Straining in every joint, the ship anchored at last as the curious crowd stared from the dock. A few faces on deck seemed familiar.

With a cry of surprise, the watchers exclaimed, "It must be Magellan's *Victoria*! Where is the rest of the fleet? Where is Magellan?"

Juan del Cano stepped forward, cadaverous as a spectre.

"Our leader is dead," he said sadly, "buried in the Philippines. Of the two hundred and eighty men who started full of hope from Sanlúcar de Barrameda,

only eighteen of us are returning; of five ships, only one."

The crowd rushed on board to embrace the eighteen heroes and to mourn with them the loss of Magellan.

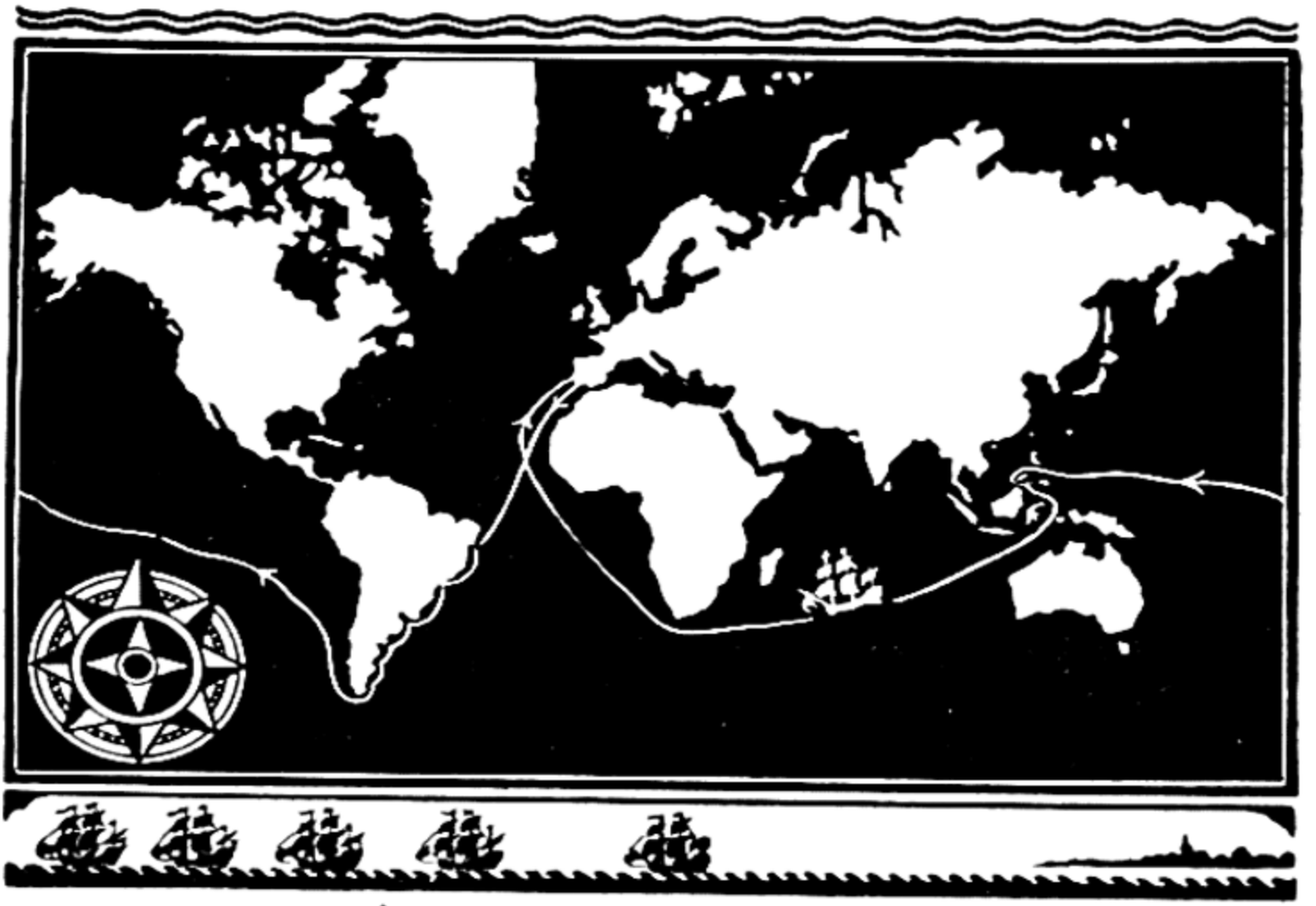
"But," said del Cano, brightening, "we have found the Spice Islands, Magellan's goal. We have seen wonders.

"When we left the Philippines, with anguish for our loss, we came upon an archipelago, and landed first at Mindanao. The King himself entertained us. There, in the light of torches and under swaying palms, we ate rice and fish, and drank palm wine. To swear his undying friendship for us, the monarch drew blood from his hand, and smeared with it his face and the tip of his tongue. We did the same. At night we slept on a bed of reeds and palm leaves. What is that you ask? Mindanao's wealth? Of course. Ginger, yes, and in the valleys, gold, about which the natives care little.

"But let us tell you of Palawan, our land of promise. We called the island so because we suffered with hunger before we came upon it; and might have starved but for the King of Palawan.

"Those lovely days, those sunny islands! Once we rode on elephants and chewed betel nuts. In our honour the streets were lined with guards in cloth of gold. From the King came refreshments of cloves and cinnamon. It took seven men to carry his gifts to us. Strangely enough, we were not permitted to speak to the King. His abode is a magnificent palace, each room richly hung with silks and brocades. When we got there, we naturally expected to be admitted to his presence. But we were met by an officer who told us that we could not speak to the King. If we wished

anything, we were to tell it to him. We did. He communicated it to his chief. The chief passed it on to a member of the royal family. The royal one then spoke, not directly, but through a tube, and not to the King, but to one close to him. We did not learn what happened then. Perhaps the King is shy.



MAGELLAN'S *VICTORIA* SAILS ROUND THE WORLD

"We saw how spices grow. In Ternate, we examined a clove tree, its bark dark and fragrant. The cloves grow in clusters at the end of twigs amid crimson flowers. At Borneo, the largest island on our map, we saw camphor and nutmeg trees.

"At Ternate we asked for Francisco Serrano, to sadden him with news of the death of his best friend. But it was unnecessary. It seemed as though the two friends were bound in death as in life. Death had no

sooner fallen upon Magellan in the Philippines than it hastened to take his friend, too, on the island of Ternate."

"Those lovely islands," said another. "We dream of going back, of watching the wisps of dawn float over the peaks and paint the bays blue, of hailing the little Malay fishermen, '*Sandara, appa giadi!*' which means, 'Greetings, friend!'"

So homeward the *Victoria* had sailed, by way of Vasco da Gama's route, round the Cape of Good Hope, up the west coast of Africa, straight to Spain. The eighteen men had circumnavigated the globe. There was no longer any question about the shape of the earth. Magellan and his comrades had swept aside the myth of an Atlas upholding the world on his shoulders, of a flat ocean from whose edge you fell headlong, and similar fearsome tales. That the world is round, this first circumnavigation of the globe proved.

The world's debt to Magellan will be remembered as long as ships sail through the Strait of Magellan, and men glance skyward. For there, in those heavens that looked down on the map-maker, two clusters of stars are inlaid. They seem like two clouds of mist. Magellan's name is written in these starry clouds, for men call them the "Magellanic Clouds."

HENRY HUDSON

THE FATAL PASS

After Columbus, the world was being discovered at a breathless rate. Other nations of Europe were not long in following the lead of Spain and Portugal. In 1497 England sent out John Cabot and his son, Sebastian. John Cabot added Newfoundland and Nova Scotia to the map. Then the riddle of a short route to Asia came up, and for over a century the English and Dutch explorers tried to find the answer. "There must be a short route," said Sebastian Cabot.

THE news of Columbus's reaching Asia had thrilled every one in Europe; and merchants made ready their ships for a brisk trade across the Atlantic. But nobody could find the great cities that Marco Polo had described. Where were the golden palaces, the silk attire? Here were only naked savages and deep woods.

"This is not Asia," announced Sebastian Cabot. "It is a new world."

The Cabots could be trusted in things geographical. John Cabot, the father of Sebastian, had come from Italy to settle in Bristol, England. In 1497, he too had gone west to reach the East, had cruised along Newfoundland and Nova Scotia, on the search for glittering palaces and great cities.

Now as an old man, he lived in Bristol, surrounded by his globes and his charts.

"Yes," he said, "in the water between Asia and Europe, lie the American continents."

That was what disappointed the people of Europe, the merchants most of all.

"If only this stumbling-block of America did not exist," they said, "we could simply sail farther west until we did reach Asia."

To do business with Asia was their greatest ambition. They would have sent their ships round Cape Horn in the wake of Ferdinand Magellan, or round



THE AMERICAN CONTINENTS, AS THEY WERE KNOWN AT THE TIME OF THE CABOTS

the Cape of Good Hope in the wake of Vasco da Gama; but those routes were long and dangerous.

Sebastian Cabot held out one hope. "Depend upon it," he said, "there is a way to the East. Somewhere to the north of Europe, there must be a waterway leading to the seas of China. Let us find this North-east Passage."

He was nearly eighty years of age, too old himself to sail. But some merchants outfitted three ships, and the search for the North-east Passage to Asia began.

The gallant fleet disappeared somewhere in the Arctic. The merchants waited. They waited long. At length, one ship came back. Sebastian Cabot was impatient.

"Have they found the North-east Passage?" he inquired.

They had not.

Where were the other ships?

Lost. Together they had sailed up the coast of Norway. But rounding the North Cape, the ships had been driven apart by a storm. They themselves had continued east round the shores of the Kola peninsula, and had landed in Russia.

At once a rescue party went off in search of the lost ships. When they had passed Novaya Zemlya, in a cove on the coast of Lapland they came upon the two ships fast in the ice. The rescuers called out. No answer. They boarded the whitened decks. No sign of life. They opened the doors leading to the cabins and found the captain and his crew seated at the table or resting in corners, frozen to death.

The Northern Passage to Asia had claimed its first victims.

Fifty years went by. Sebastian Cabot was dead, but his geography lesson still lived. The merchants of England were still ambitious to reach Asia by sea, and they recalled Cabot's instructions to sail through the northern seas. In 1607, they determined to try again. They would risk another vessel. They must be careful, however, in choosing a captain. They would have the best explorer available.

"Who is he?" they wondered.

"Henry Hudson," they were advised.

II

When Captain Henry Hudson ordered the sails unfurled and the anchor drawn up, ten men sprang to their posts. As the *Hopewell* glided out into the open sea, the May morning was filled with quiet sunshine, and the fields sparkled. Buttercups were out, and clover, and orchard blossoms. The hedges rustled with birds. The nose of the *Hopewell* on this May day of 1607 turned in to the North Sea. At the North Pole, grimly thought Captain Hudson, the scenery would be quite different. When they came back, even the toughest sailor, his eyes dewy with joy, might fling himself under one of those sheltering oaks and vow never again to leave England.

But they would know something about that passage to China that Sebastian Cabot believed lay at the top of the earth. They would bring back that knowledge. Captain Hudson could match any explorer in courage, but he explored for knowledge, not for hero-worship. He would not risk the lives of his men for glory alone. The deadly weapon with which Nature guarded the secret of the Northern Passage was ice. To be trapped in an ice-pack might be the fate of a reckless hero; Captain Hudson was a careful scientist. He could be relied upon to come back.

His men knew that. They saw their mild, thoughtful captain bent over his log-book, writing the account of their voyage: how, when they took soundings off the Shetland Islands, they drew out of the water a black ooze full of yellow shells; how north of the Faroe Islands the needle of the compass dipped; how they sighted Iceland; how they sailed along the bleak strand of Greenland and saw no life except for an Eskimo

now and then, or a musk ox. They listened to him when he explained that their chart was wrong, because it joined Greenland and Norway. Captain Hudson would steer them through the frozen dangers of the voyage.

Due north they sailed. The rigging froze, the fog bound them. It began to storm ice. "Veer to the east," ordered Captain Hudson. The north was blocked by a barrier of ice. The search for the North-east Passage was on.

Out of the sea, one day, rose the ghostly peaks of Spitsbergen. Only about ten years had passed since the Dutchman Barentz had put Spitsbergen on the map. Poor Barentz! Never had a better explorer walked the deck of a ship. Yet even he had been trapped in the ice, and given his life to the fatal passage. Captain Hudson, as he cruised north round the five islands of Spitsbergen, thought perhaps that Nature was determined to keep this one secret from human eyes. All was mist, snow, ice. A glimmer of greenish blue light along the coast of Spitsbergen warned him of glaciers.

At last, at the northern end of Spitsbergen, was the place to test Cabot's theory. Now was the time to steer across the North Pole. But the way was locked by the everlasting ice.

"We can't go that way," said Henry Hudson. "Let us try the southern end of Spitsbergen."

A fog fell upon them and a storm beat down. The rudder was almost useless. Then one day through the fog they heard the North growl. Hudson knew the fearful sound. It was the voice of a swell as it beat against the hollow sides of ice.

"We are drifting on an ice barrier," he warned. The rudder was powerless against the fierce current.

The men lowered a small boat. Alongside the hulk of the *Hopewell* they ranged their boat, and pushed against the current that was slowly carrying them to doom. The struggle was unequal, ten pairs of bare hands against a wild sea. But an ally appeared in the shape of a gale of wind, and the ship retreated.

"Can we go by the southern end of Spitsbergen?" Captain Hudson wondered. "Winter will be setting in soon. No, back to England!"

Back to quiet sunshine and fragrant meadows and the tuneful hedges, to England in September.

The merchants who employed Henry Hudson were, of course, disappointed that he had not found the passage to China. To console them, he gave them a 'tip.' The coast of Spitsbergen, he informed them, teemed with whales, every one of which was worth hundreds of pounds in blubber, and oil, and bone. And that was how the waters of Spitsbergen began to teem with English whalers.

"But what of the Northern Passage to China? Is it nothing but a vision of the Cabots?" he was asked.

"Not at all," he replied. "I have explored but one Polar area. Now between Spitsbergen and Novaya Zemlya . . ."

The merchants asked if he would go the following spring.

In May, 1608, the weather-beaten *Hopewell* again faced the ice-pack off the northern coast of Norway. Again Henry Hudson was balked by the Arctic fastness.

"The passage," he reckoned, "lies perhaps to the north-east."

His plan was to cut through the sea—the Barentz Sea—between Spitsbergen and Novaya Zemlya, or to enter the Kara Sea through an opening in Novaya

Zemlya itself. He turned therefore to the east. Once Willem Barentz had done the same. He had paid with his life; the fatal passage had taken many lives. From his look-out, six months later, Captain Hudson scanned the unearthly stretch round him. The scene glittered under the long winter sun. Masses of ice swung past him. The gulls screamed against the masts. He spied on a huge rock a sleeping family of walruses. He heard the roar of the polar bear, and caught sight of him often, his long neck swaying, monarch of the ice.

At Novaya Zemlya, he began to examine the coast for an opening to the Kara Sea. Fate would perhaps be kind to him this time.

All at once huge blocks of ice came swirling towards him. It was as though the spirit that guarded the passage to the east was angry. Each man of the crew seized a beam or a spar, and leaning over the sides of the vessel, fended off the huge masses until the guardian spirit exhausted his ammunition.

"No use," thought Hudson. There was no passage by the north-east. Again the English merchants would be disappointed. He had another idea, though. Next year he would try again.

III

"We must be off the banks of Newfoundland," the captain of the *Half-moon* surmised. They had been drifting for some days now, wrapped in a heavy fog. Captain Hudson himself was wrapped in misty dreams of the North-west Passage. Like the Flying Dutchman in the old legend, he seemed doomed to toss the seas for ever.

The people of Europe had watched him ever since he had penetrated the ice-fields deeper than any other explorer.

"If that passage to Asia can be found, Henry Hudson will find it." So had felt some Dutch merchants, and had given him the *Half-moon* and a crew.

"This time," thought Hudson, "I seek the passage in the north-west."

He got a letter from another famous adventurer, Captain John Smith. "You will find the passage, I believe, a little to the north of Virginia."

Now he stood to the north of Virginia. When the sun lifted the fog, would it reveal the secret pass cutting through the New World? When the fog lifted, it revealed a shaggy coast and six Indians paddling towards the *Half-moon*.

They were a pleasant lot, anxious to be of service. Captain Hudson entertained them with food and a few gifts. The braves were pleased.

"Down yonder," they pointed out, "the captain will find heaps of gold."

The captain sought a treasure more precious. Knew they aught of a water-pass that cut clear through the land?

They did not, and off they paddled.

The *Half-moon* began its cruise south. The lazy islands rose up, and the shores of the new world waved to them on those fine July days. The men longed to anchor in some delightful cove, and roam through the cool woods. But Hudson's mind was as restless as the sea. He stood on the poop, his eyes fixed. Piercing the shore somewhere was a deep channel, the secret pass. One day they stood off the coast of Virginia. It would have been good to land, to

shake hands with John Smith. But the secret pass, Captain Smith had written, lay to the north.

The *Half-moon* wheeled. Up the coast they sailed. One day they came upon a bay, the Chesapeake.

"Can this be it?" wondered Hudson. He sounded the channel. It was too shallow. "Pull up the sails," he ordered.

They came to another bay, the Delaware. "This may be the North-west Passage," he thought hopefully, and steered into it.

They had not gone far, however, before his hope dwindled.

"Shift the sails," he ordered. The Flying Dutchman, said the old legend, was tormented by the search for something he would never find.

When the sun rose on September 2, 1609, Henry Hudson was gazing at the cliffs of Long Island, and the gleaming flats of Sandy Hook.

"What a pleasant, fertile shore!" exclaimed the men.

But it was not the shore that attracted Henry Hudson.

"Let us examine it closer," he ordered.

Off Staten Island they anchored, and rowed ashore. The air was scented. Butterflies floated among the bright weeds of the field. With a gay shout some of the men darted into the woods. Seldom had they seen such magnificent oaks, or such graceful lindens. Seldom had they tasted such strawberries, such plums. At this rate, the search for the secret passage was like going to a picnic. Captain Hudson recalled the frozen rigging and the bluish gleam of glaciers.

A troop of Indians appeared, some dressed in feathers, some in skins. They bore the white strangers a welcome. Would they stay? It was eighty-five years

now since white men had been near this tribe. At that time Giovanni da Verrazano of Florence, Italy, had cruised by, and like Hudson had marvelled at the beauty of the cliffs and the harbour to the south. But with Verrazano it had been a passing fancy. He had not sailed into the harbour at all.

Captain Hudson pointed to the harbour. "Does the water reach far, very far into the land?"

"Very far," agreed the Red Man.

The heart of Henry Hudson leaped, "Can it be at last!"

They passed into a river flanked by steep bluffs. Above the jutting rocks stretched a park-like plateau. For hushed hours the *Half-moon* glided on the grey water between the walls of rock. A deer erect and motionless, a startled Indian, the far-away splash against the rocks, the sails of the *Half-moon* outlined against the cliffs—this was the picture seen by white men during those days in early September, 1609.

"An enchanted land," thought Henry Hudson. "So fertile, so ready to burst into life."

A canoe appeared, more canoes; a shout of welcome from the natives of the enchanted country. Hudson ordered the anchor to be dropped. The chief of the tribe was there to invite Hudson to dinner in the village. The white chief accepted, for the sake of the dinner and for news of the hidden pass to Asia.

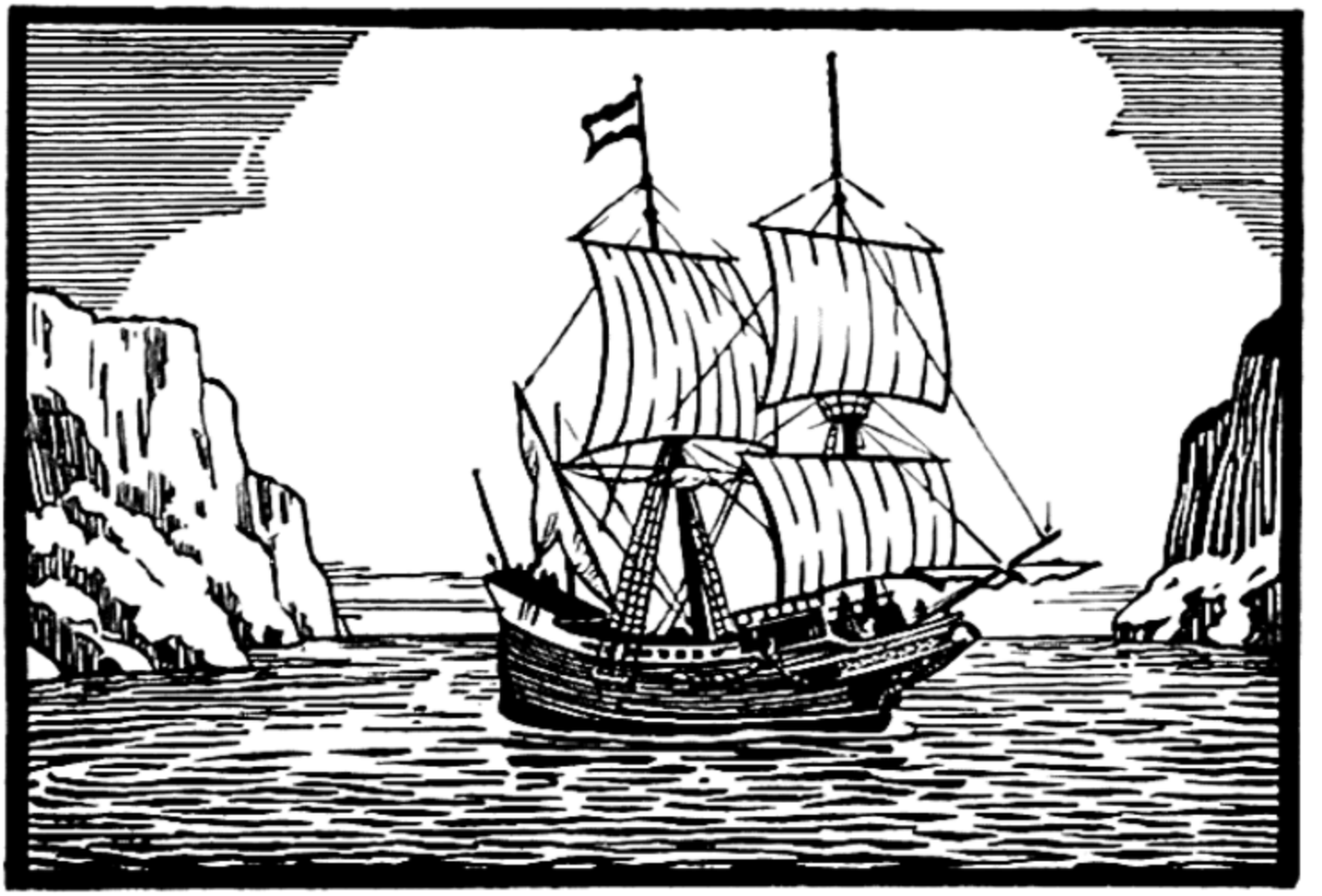
Seated on mats in the tepee, Hudson and his men were served roast game and maize and much grave silence. In dumb show Hudson asked, "Does the river roll far?"

"Far, yes. . . ."

Hudson rose. Mistaking his hurry for fear, the Indians brought out their arrows and, to reassure him,

broke the shafts to bits. They could not understand the white man's hurry. They knew nothing of the call of the hidden pass, of Hudson's hope that round the next bend, lo! the sea and India.

The *Half-moon* sailed on. The Catskill highlands rose. The Channel wound and twisted, and Hudson's



FOR HUSHED HOURS THE *HALF-MOON* GLIDED BETWEEN THE WALLS OF ROCK

hope ran dry. He had travelled leagues up the river, and it seemed to him that the channel was growing shallower. He dropped anchor and waited while his scouts rowed on in their small boats. His fears were verified.

"The river grows narrower and shallower," the scouts reported. "It will end soon."

The North-west Passage had again eluded him.

Once again must he go back home and say, "I have failed."

He could not foresee round the bend of the ages the human hive of New York, and its great artery, the river he was putting on the map—the Hudson River.

"But somewhere through America lies the pass to Asia," he thought. "Far to the north of this river, perhaps." In his mind he could see it, and he still hoped to see it with his eyes, the next year.

IV

"At last!"

Out of the dense fog loomed two noble cliffs. Between them churned the waters into which Hudson steered his new ship *Discovery*. The rain beat wildly on the lurching decks. The wailing of gulls from Labrador on the left accompanied the ship through the narrows. But it was the sight of the open sea into which the *Discovery* now swept that elated Captain Hudson. He was sure he had found the secret pass. This sea was not on his chart. He had but to cruise along its shores, he felt, and one day, soon, would appear the North-west Passage. At last!

His men thought him mad, possessed, like the Flying Dutchman. For weeks now they had breathed fog and ice, until the sight of those drifting shapes maddened them.

"We won't go on," they had said, back in Ungava Bay. "This is a fool's errand."

But Captain Hudson had been so kind about their mutinous speech that he had won them over. He had shown them his charts and papers.

"Think of glory," he had urged. "None has ever

dared what you dare. Once Frobisher came to this region. But he did not enter this strait. Davis came. He did not enter."

And after Davis, they knew, Captain Weymouth would have entered it, but his men had mutinied and turned him back to England. "Small blame to them!" whispered Hudson's men in their dark bunks.

They had come through the strait into this whirling sea. Hudson was busy in his cabin, charting the strange region.

"We wander in this savage sea, driven backward and forward by the ice-floes. What is our course? No one knows, not even the captain."

So whispered the crew.

Once they were stranded on a rock, and for twelve hours did not know whether they would ever be heaved off. Two of them were crippled from a fall on the pitching deck. Their whispers rose hoarsely, as the *Discovery* cruised deeper and deeper into the vast bay.

Suddenly, when they were in the south-eastern part of it, Henry Hudson realized that the way back was blocked. It was now November; the seas to the north were frozen, the ice creeping down on them. Trapped! The long Arctic night was falling. The shore bristled with rocks on which piled the snow. The grey shadows of a wolf-pack moved in the distance. A few trees, as twisted as the hopes of the men, stuck out from the frozen soil. On this shore the crew hauled their vessel. They were marooned.

The only hope left was that they could survive until spring. But would their stock of food last till then? Meal-times grew shorter, the men hungrier. A crust of bread or cheese became a treasure to be fought over. Everybody was suspicious of every one else.

"The captain doesn't look hungry," said one sailor to another. "He must have food hidden away in his cabin."

In the slow, dark hours, a spectre appeared, the disease of scurvy. The men saw the gums round their teeth blacken and swell. Now and then a man would rise to walk and find himself lame; scurvy had gripped him. Another would find that the nails had frozen off his feet, and wondered whether it was from the intense cold, lack of nourishment, or scurvy.

"Come, spring!" they prayed.

And spring came like a miracle. When the ice retreated, the pains of the men felt less bitter, soothed by dreams of home—England in summer bloom.

The ship could at last be launched.

It was ecstasy to be on a lurching deck again. Up with the top-sails! Home!

But the captain's orders had no hint of home.

"Now," said Henry Hudson, "now we shall find the secret pass to Asia."

The men were horrified. "He is a madman," they whispered. "If we follow him, we are dead men."

One morning, as Henry Hudson stepped out of his cabin, three men sprang upon him, pinned him down and bound him.

Hudson was quite calm. "What do you intend?" he asked his assailants.

"You will know soon enough," they replied grimly. A small boat was lowered, and into it Henry Hudson and seven of his loyal men were thrust.

"Now," the mutineers informed him, "you can hunt the North-west Passage without us."

The mighty tides of the North-west rolled down on the small boat, as the *Discovery*, Hudson's ship, sailed

homeward through the waters he had discovered, Hudson Bay and Hudson Strait, leaving him and his friends on a few planks of wood in the middle of the frozen sea.

His search was ended.

The fatal pass claimed its most illustrious victim.

JAMES COOK

THE MOST BELOVED OF EXPLORERS

Besides the question of a northern route to China, geographers were puzzled by another point. Was there a southern continent in the Pacific? Early in the seventeenth century Dutch vessels had prowled in the South Seas looking for the answer. That is why so many Dutch names appear on the map of the South Sea Islands. In 1642, the Dutch Captain Abel Janszoon Tasman sailed south from Batavia. Sighting New Zealand, he landed. But his men were frightened away by voices and the sound of a gong. "This," thought Captain Tasman as he sailed away, "is part of the Southern Continent." Was he right? The world had to wait more than a century for the answer, given at last by one of the greatest explorers of all time.

THE members of the Royal Society of England were agitated. Their calculations showed that in the near future an exciting event was to happen in the heavens. On June 3, 1769, the planet Venus, sailing in the sky, was to come between the earth and the sun, passing right across the sun's disc. An awesome and striking sight it would be, but that was not the reason it was important.

If we knew the time it takes Venus to cross the sun [announced the Society], we could deduce other facts from it; for instance, how far the sun is from us.

Well, then, why was the Society so troubled?

We cannot see this splendid phenomenon at this latitude and longitude. The nearest place it can be seen lies south-east of Magellan's route, at the point where he came to the Moluccas and the Celebes Sea. South-east of that part of the earth, the Southern Pacific is unexplored

and we do not know whether land or navigable sea is there. But whatever it is, we have to be there to see Venus crossing the sun. You must send some one [the Society appealed to the British Government], for this event will not occur again for over a hundred years.

But who was the man to go? After careful deliberation the Government decided on Captain James Cook.

"And who is he?" wondered the scientists.

James Cook had led an unhappy boyhood. He had been apprenticed to a haberdasher in a small fishing town in Yorkshire, England. The cause of his discontent was the daily sight of vessels. They awoke a strange desire in his heart. Jamie was on fire to visit the strange lands of which the sailors told. But he could not go, because he was bound for many years as an apprentice.

One day he hit upon a plan to obtain release from this hated apprenticeship. He picked a quarrel with the haberdasher, who thereupon was forced to discharge him. Leaping over the counter, the boy walked out of the shop a free man.

For the next seven years, James Cook served as sailor on the cargo-boats of a coal company. Later, as a 'tar' in the British navy, Cook's ability was soon discovered, and he was made master of the ship *Mercury*. He was a capable sailor, thought the Government. He had discharged duties that were both difficult and dangerous. For instance, he had surveyed the St Lawrence River and Newfoundland so accurately that his charts were found to be better than any made before. There was good reason for this. Cook spent his time studying geometry and astronomy. Merely knowing a few facts about surveying did not satisfy him. He wanted to understand it.

II

In August of 1768, Cook, with eighty-four men, sailed away from England in a vessel modestly named the *Endeavour*. Besides noting the transit of Venus in an unknown region, he had been bidden to explore that region. "We think there is a continent somewhere in the South Seas," said geographers. "Ptolemy's maps show there must be some land there, perhaps as large as Europe or America. Magellan once passed through a strait at the tip of South America. Perhaps a continent lies south of that strait?"

As the *Endeavour* sailed to Rio de Janeiro, and then to the southern tip of South America, the fantastically strange life that teems in the sea was closely studied. Cook was no ordinary sea captain, and did not have to be told to keep his eyes open. He was by nature keenly interested in scientific things.

> Flying fish [wrote Cook in a letter] have appeared to us, darting gracefully across the water. Their sides have the colour and brightness of burnished silver.

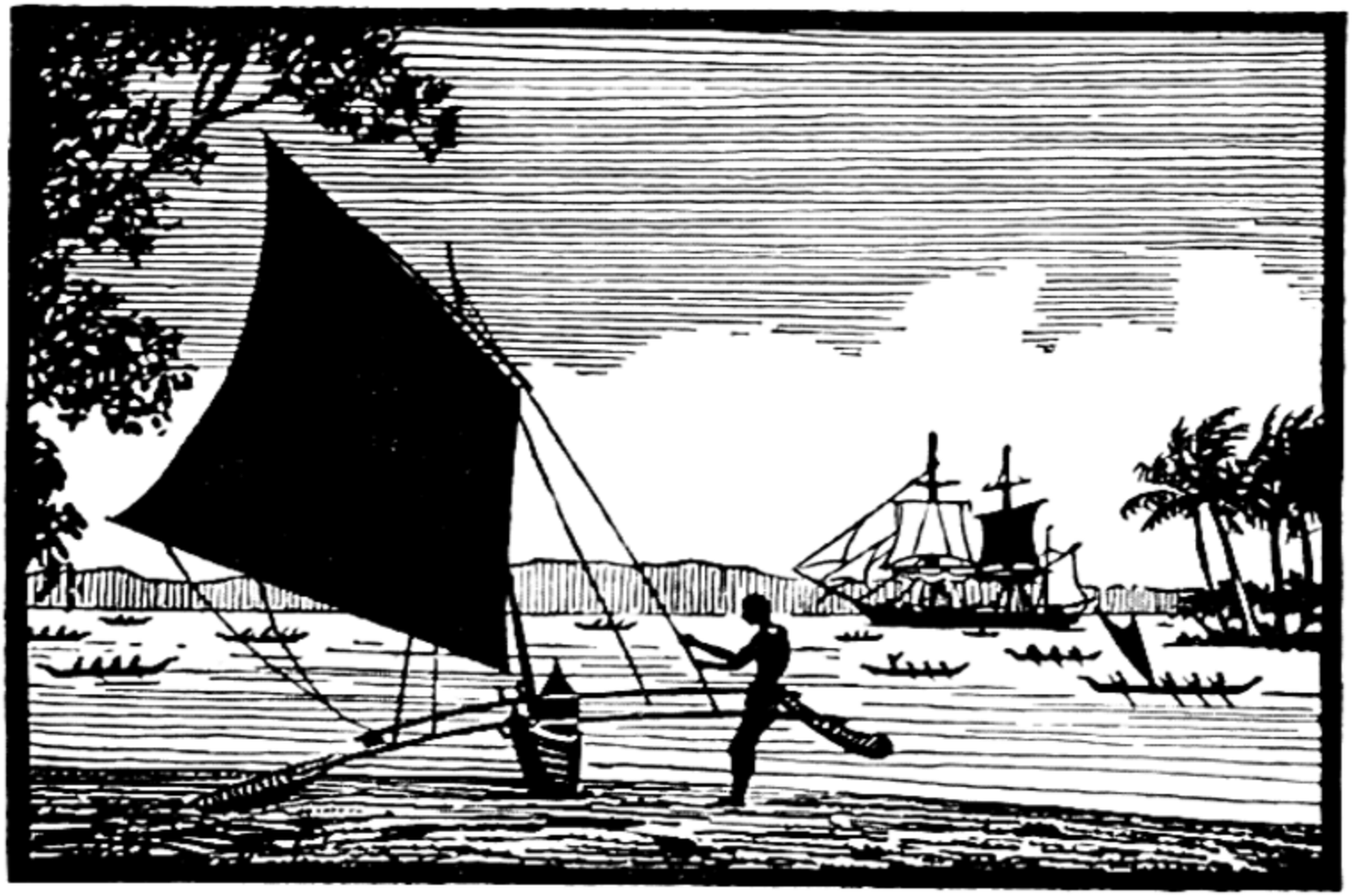
As they sailed on, the sea seemed to emit flashes like lightning. What was it? The sailors cast nets for them and brought up a kind of jellyfish, which looked like metal in a white heat. With these medusæ, as they are called, were caught some small crabs shining like glow-worms.

Doubling Cape Horn, even in a heavy sea and wild gale, was no mighty effort for so skilled a navigator as Cook. The *Endeavour* steered for Tahiti, the island from which the scientists were to view the heavens. There was one cause for anxiety. Suppose the morning of June 3, 1769, dawned murky and the clouds hid the

sport of the stars. The perilous journey would have been undertaken in vain.

There was another anxious question. Would the natives of Tahiti be friendly to the strangers?

"The natives are to be treated with all kindness,"



THE NATIVES CAME IN CANOES TO MEET THEM

Cook warned his crew sternly. "You have guns. Beware of turning them on human beings."

One great day Tahiti appeared out of the warm sea, a land of beauty, with rills that gathered in cool streams, hills soft in the tropical sun, and reefs of coral that shone brilliantly. Surrounded by green islets, the land seemed a fertile paradise.

Fear of the inhabitants proved unfounded. The natives came in canoes to meet them, bringing green branches of trees as tokens of peace and friendship.

These the crew stuck in the rigging, to show that the English, too, were peaceful. With some of his men Captain Cook went ashore. The chief welcomed them, and gave them permission to set up their scientific instruments.

At every step the trees and the flowers, the butterflies and the fragrant earth delighted the sea-wearied men. The next few weeks, while they were waiting for the third of June, Cook was closely studying the customs of the Tahitians, and the plants and animals of the island. Every day the ship's scientist, Dr Solander, went out in search of specimens. When he came back to the ship from his excursions, "What luck, doctor?" Cook would ask him. "Show me what you have found."

The captain found the Tahitians a handsome dreamy race, cleanly in person and affable towards strangers. Of course, an Englishman and a Tahitian see things not quite the same way, and now and then a quarrel would arise. But Cook was always on the look-out. If ever his own men were at fault, he punished them; if ever the natives, he reasoned with them.

A few times, indeed, it seemed as though serious trouble would break out between the two races. At those times the English crew were ready to put their cannon into action, when the captain did a queer thing; he called for retreat. Because he was a coward? Not at all. There was no braver soul alive than James Cook.

"They are stubborn and we must yield, because we are so much stronger than they. What do we gain by blowing a few creatures off the face of the earth? Their sticks are no match for our guns. Hold off!" So, with his tact and gentleness of soul, the captain

smoothed out the rough spots of his relations with the Tahitians.

He did more than save the natives from the guns of his men, for he was no mere adventurer, this peace-loving captain. He was not like Cortes, the sound of whose name, two hundred years before, had sent the American natives fleeing in dread. Nor did he, like Cortes, look for gold among the natives. Instead he gave them what was more valuable than gold. Tahiti was fertile, but did not produce many kinds of plant-food. The captain, therefore, planted seeds which he had brought from South America, so that the Tahitians might enjoy the orange, the lemon, the lime, and the water-lemon. For this the Tahitians loved him. They played for him their music with drums and flutes. They blew the latter with their nostrils. For "Captain Toote," as they called him in their soft, musical language, they danced and wrestled.

"I admire their spirit in athletics," said Cook. "The victor never crows about his superiority, and the vanquished never whines about his poor luck. They are sportsmen."

The names he gave the new places he discovered show the peaceful sentiments of Cook: "Society Islands," after the Royal Society that sent him on the expedition; "Mercury Bay," because in that bay he studied the planet Mercury; "Friendly Islands," to remember how cordially the natives welcomed him.

At last came the night of June the second, the night before the eclipse of the sun by Venus. The scientists of the party could not sleep a wink for nervous excitement. "What if to-morrow be cloudy?" But the morrow dawned clear, the sun shining and waiting radiantly for Venus! At twenty-five minutes and

twelve seconds after nine o'clock in the morning, a dark speck, the planet Venus, was seen on the edge of the sun. Eighteen minutes and twelve seconds later, the planet was completely inside the sun's rim. Slowly it crept across the face of the sun. The planet took more than six hours to make its transit.

The expedition had been successful. Captain Cook felt it had been worth the thousand hardships. Now he was free to look for the South Sea continent.

As the ship weighed anchor, the islanders rushed out to the shore to cry farewell. Chief Orie wept aloud. "Come back," he pleaded.

III

Nearly three months later at Mercury Bay, New Zealand, Red-smeared Dragon, a little boy of eight, was looking intently over the sea.

"Did you ever see such a big bird on the water?" he asked his playfellows. "What beautiful white wings it has!"

"Look!" cried one. "A smaller bird is descending from the big bird."

"It's coming towards us," added another.

"The small one is not a bird," slowly said Red-smeared Dragon. "It looks somewhat like a canoe."

The boys turned to a group of old men for advice.

"These are goblins," explained one sagely. "They are rowing with their backs to the land. Only goblins can do that, for they have eyes in the back of their heads."

As the goblins stepped on the beach, all fled fearfully to the thicket. But when the children, peeping from behind a tree, saw these wondrous beings walk

peaceably about, picking up stones and grasses, they said, "Perhaps these goblins are not as wicked as our Maori goblins."

Timidly the children ventured from their hiding-place. They lighted a fire for the goblins, and offered them sweet potatoes. But suddenly they saw a most amazing sight. One of these beings pointed a kind of walking staff at a cormorant perched on a tree. The stick flashed lightning. A thunderclap resounded. At the same instant the bird fell.

Frightened, the children fled. But when they heard the goblins laugh merrily, they took heart and returned to look at the fallen bird.

"The bird is dead," exclaimed Red-smeared Dragon.

"But what killed it?" his comrades wondered. "These goblins kill with thunderbolts."

The boat which Red-smeared Dragon and his friends had taken for a bird did not leave the bay, and one day, little Red-smeared Dragon and some of his friends were taken to it in a canoe. Wrapped in their flax coats, they sat close together on the deck, fearing to move. If the goblins should bewitch them they would never see their homes again.

Red-smeared Dragon's sharp eyes missed nothing. He easily made out the leader of the goblins, who was grave and dignified. This goblin walked up to Red-smeared Dragon and his friends. After patting the boys' heads he took from his pocket a large nail. The boys sat motionless. At last Red-smeared Dragon looked up at the goblin captain. His eyes were so kind that Red-smeared Dragon laughingly held out his hand; and the nail was his!

When the children went home, they agreed that the goblin captain was a "*tino rangatira*"—a perfect

gentleman and a great chief. His precious nail Red-smeared Dragon carried as a charm slung round his neck. And that is how a Maori boy remembered Captain Cook's visit to New Zealand.

IV

Cook was still searching for the continent said to be somewhere in the South Seas. But from Cape Horn on he had found no such land. "I do not find a trace of ocean currents," he reasoned, "and that means that no continent is near." Only islands dotted the ocean, some of them only lagoons surrounded by reefs and coco-nut palms.

When he reached New Zealand, map-makers still believed that the South Sea continent existed; but Captain Cook was sceptical. From Poverty Bay in New Zealand, he sailed south following the shore. In the course of time he found himself back in Poverty Bay. No, this was not the South Sea continent. It was an island, two islands in fact. Within six months' time Cook charted the twenty-four hundred miles of New Zealand's coast-line; and then, from a point he called "Cape Farewell," sailed away to the west.

To the eastern coast of New Holland, now called "Australia," a land then practically unknown, Captain Cook steered his boat. All he knew about New Holland was that a few European vessels had touched it. Along the coast of Australia he sighted some natives, their bodies decorated with streaks of white paint, fishing.

Once in a harbour, he landed for fresh water and fuel. Here for several days the ship's botanist, Joseph Banks, was busy gathering countless specimens of

new flowers and plants, and studying trees that were unknown to the scientists of Europe. "Botany Bay" Cook named the harbour.

As he continued northward, he mapped the bays, islands, capes, and rivers he saw. Everywhere he examined the plant and animal life. He was a scientist-explorer.

He come to the sand-banks, and the coral reefs of the Great Barrier Reef. In and out of the islands he kept weaving, at great danger to the ship and crew, for there were constant threats of shoals and coral rocks. Once, indeed, the *Endeavour* did strike a rock which put a nasty hole in her keel. For twenty-four hours it looked as though they would go under. Only the resolute, quiet manner of the captain and the loyalty his men bore him saved their lives. His was a kindly but effective discipline.

"Why must we risk our lives in this useless way?" grumbled some of the men.

Cook pointed to his charts and his note-book. "How else," said he, "could we describe all these islands or study the continent behind them? How else could we help our scientists in their study of plants? And how could we help the sailors of the future more than by showing them which are the navigable parts of these waters?"

Skilfully he took the ship through the Great Barrier Reef. Then from Cape York, the northernmost part of the coast, he sailed through Torres Strait to New Guinea. From Batavia he sailed back to England, having discovered that Australia and New Guinea are nowhere connected by land.

Captain James Cook had succeeded beyond expectation. He had studied the transit of Venus. He had

proved New Zealand to be two large islands. He had shown that there was no South Sea continent near Tahiti. He had explored the eastern coast of Australia. All these discoveries he had put on the most accurately charted maps of the century. What greater achievement could any explorer boast?

"I have not lost one man by sickness during the whole voyage," he said. And that pleased him most.

V

The Royal Society was again worried. "There are so many islands in the South Seas; there must be a continent, too. Perhaps it is much farther south of Tahiti than we had at first thought."

No one better than Cook could be chosen to settle the question. "His charts of New Zealand are extraordinary," said geographers. "Very few parts even of the coast of neighbouring France are as accurately drawn as is this remote coast."

The captain was ready. He had been studying the problem of how to meet the greatest enemy of men at sea—scurvy. The old captains—Vasco da Gama, Magellan, and Henry Hudson—had seen their men perish miserably from scurvy. The welfare of his men was dear to Cook.

"Scurvy must be due to the food we eat on shipboard," he thought. "Salt meat and hard-tack are unnatural. Plenty of vegetables will cure scurvy—celery, sauerkraut, peas, carrots." No commander before Cook had been so careful about the diet of his men.

He was right. During his last voyage which took him round the world on a cruise of over sixty thousand

miles for a time of three years, he lost only one man out of one hundred and eighteen. The spectre of scurvy was laid.

On this voyage Cook hoped to settle definitely the question of the southern continent. He intended to explore in the waters that no European had ever before sailed. He would touch the Antarctic Circle as closely as he could. Being a true geographer, he had another purpose in mind: to observe the inhabitants in whatever islands he came upon, and win their friendship.

He began by venturing farther south than any other sailor had dared. The cold became intense, and the polar gales swept the decks with seas. Icebergs loomed through fog like spectral cliffs. The sea hammered their perpendicular sides. Cook picked his course cautiously. To be caught on the weather side of an iceberg in a rough sea meant being smashed to bits.

The ship approached an ice-floe which extended as far as the eye could see. In vain Cook tried to sail round it. Ice-fields filled the horizon. The sailors' hands bled from the intense cold. Was there a continent farther south? It was foolhardy to go on. The cold had become unbearable. Cook, therefore, steered north for New Zealand.

He could not resist revisiting old scenes and old friends in sunny Tahiti. The good King Orie, when he heard of Cook's arrival, ran out, threw his arms about him, and wept for joy.

"I have brought you something," said Cook. He led ashore three cows and one bull, a horse and mare, two rams and ten sheep. "These will be very useful in time," he promised. Then he planted roots—potatoes, turnips, parsnips, carrots—and taught the islanders how to cultivate them.

Another man might have returned to England to announce that there was no South Sea continent. Not Captain Cook. There were still some parts of the ocean near the Antarctic Circle he had not explored. To be thorough, he would again have to strike south, and his crew would again suffer torturing cold and the dangers of icebergs. Yet such was the confidence of his men that they cheerfully followed him again among the icebergs and treacherous Antarctic currents. And finally, James Cook proved beyond a doubt that no continent existed in the South Seas.

In a third voyage to the Pacific Ocean he discovered the Hawaiian Islands. To ensure further his claim as the greatest explorer of the century, he cruised along Oregon to the Bering Strait, proving that a North-west Passage from the Atlantic Ocean, once imagined by Henry Hudson, could not lead into the Pacific Ocean.

To Captain James Cook England owes its possessions in the South Seas. But the world owes much more to this most beloved of explorers, because he solved a great geographical problem, and because he spread the seeds of civilization to new regions of the globe.

PART II

Filling in the Map

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LEWIS, CLARK, PIKE, AND FRÉMONT

MAPPING THE UNITED STATES

When the outlines of the map had been drawn, explorers took up the task of filling in the details. Colonists had gone out to the newly discovered shores; many European nations sent settlers to the Pacific islands and to Africa. The Spanish and the Portuguese colonized South America. Along the Atlantic shore of North America spread the English colonies, which later became the United States of America. The new nation owned and knew the territory up to the Mississippi river. But very little about the prairies across the river was known. That land belonged to the French, who knew only that they owned it because of what had once happened.

Meriwether Lewis and William Clark

THROUGH the early days of the year 1682, a flotilla of canoes picked its way south among the snags of the Mississippi. The adventure had started in Canada, its leader the Frenchman René Robert Cavelier, Sieur de la Salle. La Salle had been told about this region by his countryman, Louis Joliet. When he had paddled for three months, it seemed to La Salle one day that the water tasted a bit salty. He had, in fact, reached the mouth of the 'Father of Waters.' Landing on a small island, he erected a pole whereon to fix the arms of France. Then he ordered a salute of muskets and a chant of prayers. "In the name of Louis, the great King of France," La Salle took possession of the territory, and in his king's honour, named it "Louisiana."

A hundred years later, five million people, calling

themselves free citizens of the United States of America, were settled to the east of the Mississippi. They could look across the river into French Louisiana, but few put foot on it or inquired as to its extent. Now and then an American trapper came out of it, and in the frontier village of St Louis told a curious tale of vast prairies, giant waterways, and Indian villages.

In 1803, the wise President Thomas Jefferson thought, "To-day we are a small nation, but we shall be greater. Some day we may want to cross the Mississippi; we may want the present home of wild things for our own. We ought to explore it."

He whispered this to his secretary, Meriwether Lewis. To him the President explained that if the unknown stretch were explored, its waterways mapped clear to the Pacific, and the Indians pacified, then the United States would have room to grow. But for this work an unusual man was needed, another Columbus or Magellan. "And where," sighed Jefferson, "is such a man?"

"Here," said Lewis.

It was no boast. The President had expected him to volunteer. The young Virginian, more than six feet of muscle and sinew, was fit for any physical hardship.

"Let me take along my friend, William Clark," suggested Lewis. "We ought to have two in command of the expedition, and at least thirty men."

From childhood Merne Lewis and Billy Clark had been friends. The two boys, with gun and dog, had spent glorious days together, plunging through the snow on the hunt for racoon and possum. Now that the ways of manhood had parted them, President Jefferson deemed it for the good of the expedition to

bring them together again. They made a good team, moreover; Lewis was learned in the lore of plants and animals; Clark, in matters military.

There was one difficulty. West of the Mississippi the country belonged to France. What would France say if the United States sent its men into her territory? Thomas Jefferson said nothing. Meanwhile Lewis and Clark went about picking their men. Then, while Clark put his men through a winter of training, Lewis spent his days in study.

All was ready. Lewis continued to feel uneasy about invading the territory of France. President Jefferson continued his silence. Suddenly came the greatest news since Yorktown: France had sold to the United States all its unknown land called Louisiana. With a whoop Merne Lewis and Billy Clark launched their expedition.

From St Louis, in May, 1804, they launched three boats up the Missouri. Captain Lewis chose to tramp alone through the woods bordering the river, collecting specimens of the soil. Game was plentiful, the woods offering a bill-of-fare consisting of deer, bear, or turkey. Early in June Lewis came upon a buffalo trail. For more than a month they had met no signs of human life, but the buffalo trail meant that soon they would face men. On the prairie, human life and buffaloes flourished together. Would the men be friends or would they be enemies?

The first men to meet them were a crew of half-breeds pushing two rafts downstream. They had a cargo of buffalo hides. They stopped and began then to 'parley' with Lewis in a friendly enough way, only he could not understand them. One of them, however, did speak a bit of broken English; and him Captain

Lewis asked for a guide across the plains. The half-breed informed him that he himself and his squaw could do that. His father had been a Sioux; his squaw, a Snake. The Snake Indians lived far to the west and his squaw, Sacajawea—meaning Bird Woman—knew the way. The parley ended with Bird Woman's joining the force of Lewis and Clark.

Now as a signal to the neighbouring Indians that strangers had arrived, Captain Lewis ordered the prairie grass to be set afire. That was like knocking at a man's door before you walked into his house. In answer to the signal, a crowd of Sioux Indians presently arrived. Under a tree near the mouth of the James river, Lewis raised the Stars and Stripes—'peace-waver' the Indians called it—and made a speech to the tribe.

"The Great White Father at Washington," he said, "has sent me bearing tokens of peace and friendship to you."

The audience listened, impassive, their bodies black with buffalo grease. Women and men dressed alike. A buffalo robe with porcupine quills covered their shoulders. Their loose garments beneath the robe were made of antelope skin; their moccasins, of buffalo skin. They listened and grunted with satisfaction. Lewis gave the order to go forward.

Summer was waning. Lewis saw herds of fleet antelope and tracks of the white bear. Continuing up the Missouri, he came to the country of the Ricaras in the foothills of the Black Mountains. The Ricaras were a handsome, intelligent nation, and most friendly to Lewis. To them, too, he spoke the message of the Great White Father in Washington, and went on up the muddy river. Meanwhile the woods had turned to pure gold.

Late in October the party arrived among the Mandans, a nation of Indians so cordial that Captain Lewis decided to make his winter camp among them. That required building a fort. Timber was plentiful, but food was scarce. The poor Mandans depended almost



CAPTAIN LEWIS GAVE THE MESSAGE OF THE GREAT WHITE FATHER IN WASHINGTON TO THE RICARAS

entirely on the buffalo herds. In the autumn and winter, when buffalo was scarce, therefore, they all but starved. Day after day they kept their hungry braves watching for the shaggy herds that thundered over the plains. The cry of "buffaloes" would empty every tepee in the village; would hoist every man and boy on a horse and send him tearing down the prairie. For the cry meant food.

Captain Lewis pitied them, and often that winter

supplied them from the stock of the fort. He visited among them with his medicine kit, and by example showed the kindness of the Great White Father in Washington. With the approach of spring came better days. Ducks and geese appeared, not too far from the waiting pot over the fire. Shyly through the trees peeked elk and deer, not too fleet for bullets. The cry of "buffaloes" acted like spring sap to the frozen forest. Spirits soared high, and the white men bade their Mandan friends farewell.

Their gay, brave mood helped them bear the increasing hardships of the journey. The Missouri had made its bed in a rolling plain on which moved heavy herds of buffalo and light-footed antelope. In June, the party came to a fork in the river; Lewis stopped to consider. The branch to the right could not be the Missouri, he decided. Naming it "Maria" in memory of a boyhood sweetheart, he kept straight on. The way to the west grew hard. The party had come to a "portage." That meant carrying boats and baggage overland for a stretch. Everybody, including the two captains and Bird Woman, could be counted on to share the load. Still the heavy rowing-boats would have made the overland travel impossibly slow. Lewis, therefore, ordered the boats to be scrapped and canoes built. Some cottonwood trees were hollowed out, and the march of the bent backs began. The grass faded. They stumbled into white sand and rock. From above and below they were broiled. Exhausted they dropped their loads for the evening camp, only to find that there was no standing wood for a fire. And no fire meant no supper.

One morning they struck the broad grassland again, but it had been freshly burned. The charred ground

said plainly, "Indians! They have seen the white men, and blazed their warning to the tribes."

"But you have nothing to fear," said Bird Woman. "These are my people, the Snakes."

Captain Lewis climbed a bluff to locate the native villages. He saw no villages just then. But he did discover that the Missouri here flowed from three branches which lay like crooked fingers on the land. He named them the Jefferson, the Madison, the Gallatin.

It was now important to find the Indians, because from them the party might buy horses. And sure enough, there before him stood a horse and its Indian rider. Unloosening a blanket from his pack, Captain Lewis made as though he were spreading it on the ground. Three times he repeated the act of spreading the blanket. In sign language he was saying, "Peace and friendship to you!" But the horse and rider vanished.

Captain Lewis followed. He did not find his Indian right away. But the trail led him to a discovery of which he had dreamed for two years. At the base of a low mountain gushed a spring of icy water. The explorer put his lips to it. Body and soul, the spring refreshed him, for it was the fountain source of the Missouri river, first discovered by Meriwether Lewis. The party had come to the Continental Divide!

He found the Indian rider, and his tribe of gay and friendly Soshones. They supplied the white strangers with horses, listened to the message of the Great White Father in Washington, and said farewell.

The trail grew rough. The explorers came to the Bitter Root range of mountains, and there on the third of September it snowed. The natives, whose straggling villages they passed, were so poor that they lived on nothing but dried berries. This humblest of

food they offered the white strangers. And Captain Lewis accepted gratefully, for his provisions had run out. He had come to a region of the Rockies barren of game. They shot a few pheasants, but that was all. But worse than hunger was thirst, for they could find no water. Captain Lewis was getting seriously anxious, when suddenly he discovered that the path sloped down and the hills were flattening. They had crossed the Rockies.

Their troubles were by no means over. One day Captain Lewis looked feverish. "We ought to stop," said Billy Clark. Merne refused. The next day one of the men saw Captain Clark waver in his tracks and sink down. His men rushed to him and picked him up in a mumbling, delirious state. Even so, he commanded them to go forward. Forward they went, carrying their captain on a stretcher. Nor was he the only sick one. They had nothing to eat but roots, and three-fourths of the party were ill. There came a desperate moment when nothing remained to do but kill a horse. It was agony to the men to do it, but so was life without food. They killed a second horse. That gave them the strength to halt by the Clearwater river and build boats. Later the spot was called "Lewiston." Finally they hurtled down the rapids into the Columbia River. On both shores rose the villages of the Flatheads, a nation of fishers.

Now the bright days returned. Past the mouth of the Walla Walla river the land grew more luxuriant. Wild life was abundant. Also the first signs of civilized life appeared—an Indian wearing a hat, and a tepee with pots and pans. "The white men have been here," reflected Lewis. The end of the journey was in sight. Great was his joy.

Over thousands of miles of swirling streams and tangled woods, hot plains and snow-covered mountains, the explorers had forced their perilous way. They had suffered hunger, thirst, disease; had risked death daily. Once when they had pitched camp on a sand-bar and gone to sleep, the moonlight had revealed a fearful sight to the guard: the banks caving in. They had barely had time to rouse themselves and board their boats before their camping-ground had changed to a rushing torrent.

Lewis especially was always running into danger. He frequently disappeared into a wood or beyond a hill in search of specimens of plant or rock. Several times he lost himself for days. Once he slipped off a cliff, luckily grabbing the ledge just as he fell. Another time a huge grizzly suddenly stood up before him. Lewis pumped several bullets into the beast, but that only infuriated it. It charged. Lewis flung himself into a river. After him plunged the bear. Suddenly a rifle spoke from shore, and the beast sank limply under. One of Lewis's men had saved his life.

Everywhere the Indians had been friendly. Indeed, but for one of them, Bird Woman, the Lewis and Clark expedition might have perished. To the white chiefs she was devoted to death; perhaps because they were so generous, perhaps because Clark once saved her life. In any case, Bird Woman was of the greatest help. She guided; she interpreted; with her people she insisted on friendship for the whites. (Among the Rockies to-day stands the Sacajawea Peak and runs the Sacajawea river—monuments to her name.)

About the middle of November, 1805, the sound of breakers came to the ears of the band.

"The Everywhere-salt-water!" exclaimed Sacajawea,

awe-stricken. The ocean, yes! The continent had been spanned. The way had been mapped out. The points named. It was time to go back and say, "Come! we have a marvellous land for our United States. Come, you pioneers! Pack your covered wagons. Come build a mighty nation on these wild and fruitful plains."

II

Zebulon Pike

When Merne Lewis and Billy Clark were homeward bound, Lieutenant Pike of the United States Army received a letter of instructions from headquarters.

St Louis
24 *June*, 1806

Sir,

You are to proceed without delay to the Cantonment on the Missouri, where you are to embark. . . .

The young man leaped up. The general had chosen him again. That meant sure promotion. It pointed to other bright prospects: that headquarters—perhaps President Jefferson himself—had approved his report on his first expedition; that he, Lieutenant (the future Captain, Colonel, General) Pike would go down in the minds of his fellow-Americans as one who had opened pathways to the West; but, best of all, that he would soon again behold the sun rise on the prairie.

At the age of twenty-three, Zebulon Montgomery Pike had won promotion to the rank of first lieutenant in the First Regiment of the United States Infantry. Headquarters observed that he was quiet, studious, and plucky. And headquarters had a good memory.

When the United States found itself the owner of the unknown wilderness across the Mississippi, President Jefferson had instructed headquarters, "Explore the new territory." Captains Lewis and Clark had started out immediately. Then, in 1805, headquarters had ordered Lieutenant Pike to map the sources of the Mississippi and to bear to the Indians of the region the message of peace from their White Chief in Washington. Opportunity had knocked for the quiet and studious young officer.

In the summer of 1805, Pike ordered his seventeen men on board their boat at St Louis, and then headed north. At first the way was pleasant. The exploring party crossed the rapids at Des Moines with safety. At Prairie du Chien, where more than one hundred and twenty-five years ago, Father Marquette had been the first white man, Pike stopped to call the Sioux chiefs "my brothers." The water meandered through islands dense with trees. Occasionally the prairie thrust its flat palm down to the shore. But usually the banks rose up in rocky bluffs. On these Lieutenant Pike clambered and drew his maps.

Thus far opportunity had been an easy guide to follow. But at the Falls of St Anthony she seemed to say to Pike, "Now let's see the stuff you're made of." The boats had to be carried. Snow fell early in October, and sickness weakened the men. Food became scarce.

"Another man," thought headquarters, reading Pike's report later, "would have turned back."

Instead, Pike went into winter quarters. Then, having built some sleds and a canoe, he struck out with a few men for the sources of the Mississippi. The call of opportunity mocked him. The canoe, with most of the ammunition, capsized. The river froze over, and the

men hitched themselves to the heavy sleds. Fingers, toes, and noses were nipped by frostbite. Pike suffered with his men, but led them cheerily onward.

At last the courage of Lieutenant Pike won out. On the first day of February, 1806, he reached Leech Lake, and shortly after, Cedar Lake and the sources of the Mississippi. There he called the Indians into council, called them "my brothers," and turned back. He had opened the way north-west to Minnesota. To headquarters he had shown his mettle as explorer, and the country just then needed explorers.

That was why, less than two months after his return, Lieutenant Pike was instructed by letter from headquarters to lay open a pathway across the south-west. Part of his duty was an errand of mercy. Two Indian nations had been on the warpath. The United States forces had intervened, and redeemed from the victor about fifty captives. Lieutenant Pike was to return these rescued Osage Indians to their tribe. He was to do even more for the Indians. He was to call together the chiefs of the warring nations, the Comanches, the Kansas, and Osages; and urge them to keep lighted the pipe of peace. This mission would lead Lieutenant Pike to the head-waters of the Arkansas and Red rivers, thought headquarters.

> In the course of your tour, you are to remark particularly upon the geographical structure, the natural history, and population of the country through which you may pass [read the instructions].

In July of 1806, Pike embarked the Indians and his own men at St Louis, and turned his two boats up the Missouri. The Indians were in mourning for their kin who had perished in the war, and sang songs of grief.

"My dear father is no more. Have pity on me, O Great Spirit. Behold me weeping. Dry my tears and comfort me."

By way of the Osage river, the party arrived at the villages of the Osage Indians where a commotion of tears and laughter met them. As the restored captives and their families embraced, Pike thought he had rarely seen so handsome and strapping a race.

"Friends," Pike said. "You now see your wives, your brothers, your daughters, your sons, redeemed from captivity. Who did this for you? The Americans! My brothers, wise men must know that peace is better than war. For if you are at peace with all nations we shall not hear the voice of Sorrow among you, but that of Joy. My brothers, the Great White Father at Washington has commanded me to make the Osages meet with the Kansas in order to smoke the peace pipe, to bury the tomahawk in the ground, and to be as the same nation. I have spoken."

At once every one of the braves shouted his devotion to America and to the cause of peace. And with that Pike departed.

The way to the Arkansas river lay overland. The prairies, drenched in September sunshine, seemed a paradise to Pike. He would climb to the top of a butte that sometimes rose suddenly from the plain, and sweep with his eyes the circle of the horizon. "How fertile!" he exclaimed. Yet over all that fruitful plain, life was sparse. Once he saw a herd of wild horses. "The offspring of those Andalusian chargers brought over by Cortes three hundred years ago," he reflected. But more than to any other creature, the prairie was home to the buffalo, thundering herds of them. Pike estimated one morning that there were three thousand

in a single herd. To human life, however, the plains were lonely, and Pike knew that he was scouting for a nation that would some day flood the plains with life and wealth.

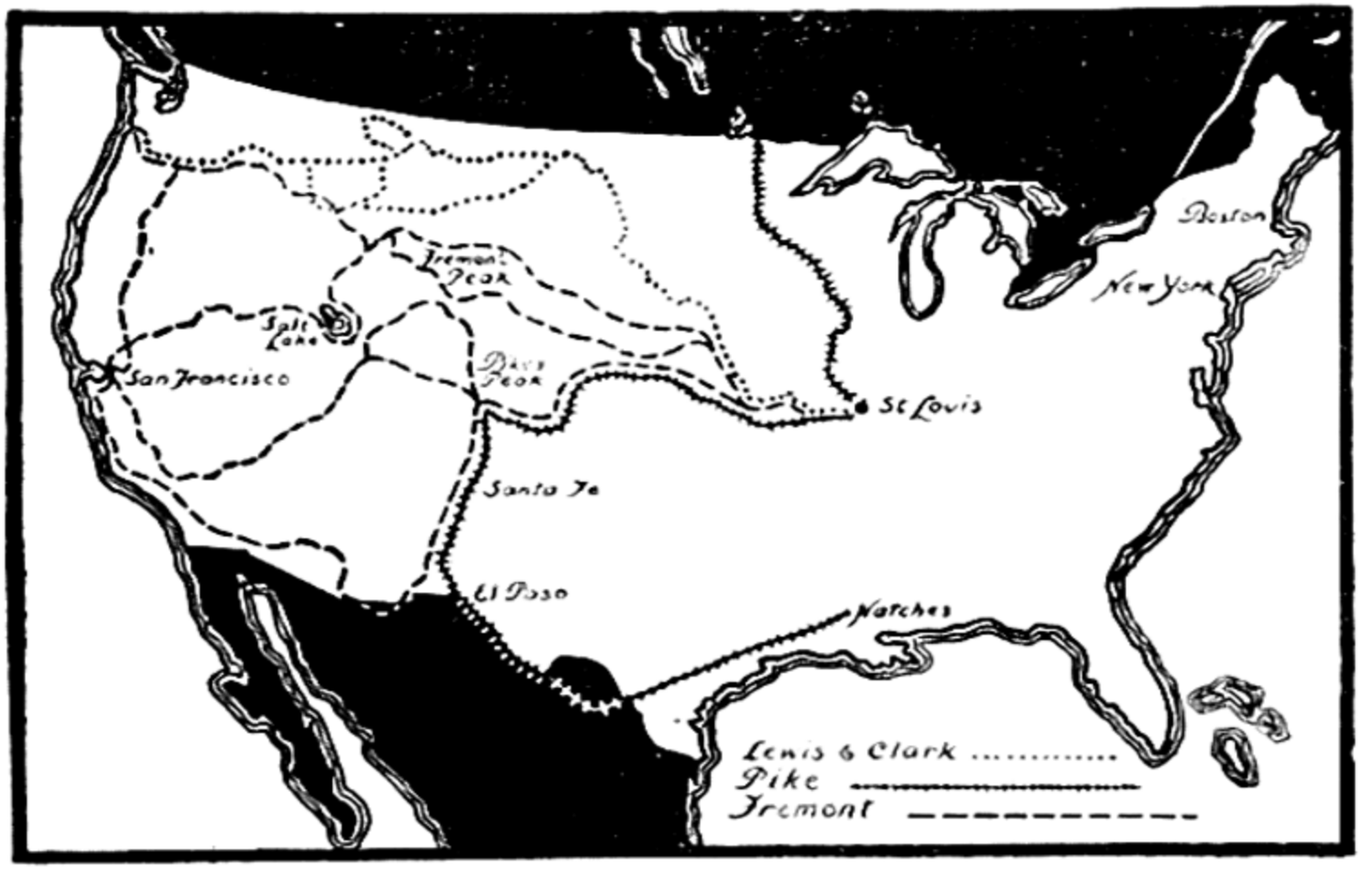
Crossing the ridge southward, he reached, in October, the Arkansas river. As he followed the course of the water, a change came over the face of the land. The autumn deepened into winter, the plains rose in billowing hills. More rare now was the sight of buffaloes. His food supply was dwindling, but even more threatening to the safety of his men were the snow and ice. Somehow Pike had not foreseen the bitter frost, and had failed to provide warm clothing. Dressed only in summer clothes, the men burned with cold. They were approaching the head-waters of the Arkansas, but before they reached them Pike ordered a hut built.

For days he had marched with a range of blue peaks ever before him in the distance. Now, his men sheltered in their hut, he chose three companions and set out towards the highest of these peaks. The men wore overalls and no stockings. Pike expected to win to the top in a day.

He was mistaken. After almost three days of an agonizing climb, he stopped waist-deep in snow and looked about for bearings. The day was Thanksgiving Day, 1806. Shivering with cold, he beheld the giant mass he was heading for. He was still sixteen miles away. The four men had been without food for thirty-six hours. At night they had taken shelter under rocks, without blankets. The temperature was below zero, and the sky foretold more snow. "One more day," he thought, wistfully gazing at the peak more than fourteen thousand feet above the sea. "One more day and we could do it." But, in the circumstances, it was

hopeless, and he turned back. He never did get any closer to that mountain, later called "Pike's Peak." But he had been the first to put it on the map.

Back in the hut Pike found his men ill with cold and hunger. Their suffering smote him with pity. Death was creeping close to them. Pike thought



OPENING UP THE WEST

that he ought to turn back altogether and leave the rest of the way unmapped. But that meant failure, and rather than admit failure Pike would risk death. "Headquarters depends on us," Pike said appealingly; and the naked, half-starved men pushed on without a murmur. They cut up their blankets for socks. The horses, however, had no such protection. The poor beasts slid on the ice, fell into ravines, and perished one by one in the wilderness of mountains.

The party reached the head-waters of the Arkansas

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SRINAGAR.

at last. Pike had been travelling south-west, hoping to find the sources of the Red river as well as that of the Arkansas. Turning north then, he came upon the South Platte. He followed its frozen course for a while, dragging his sleds on the ice, which cracked dangerously. Already Pike had mapped the sources of the Osage, the White, the Smoky Hill, the South Platte, and the Arkansas rivers. He had done great work, for before Americans could move into the West, its river-courses must be known. But Pike was determined to map one more river, the Red, and neither hunger nor frost would deter him.

The opening of the year 1807 found the party desperate. The men were already too starved to march the usual twenty or twenty-five miles a day. Most of them were too sick to march at all. Now they were faced with total starvation. Game had disappeared from the prairie. Not a raven, deer, or buffalo had they seen for days. The sight of his men lying hungry and sick choked Lieutenant Pike. He himself was in rather good health, and went out daily mapping every stream and hill around. But his men were slowly dying of hunger.

One day Pike could no longer bear the agony of his men and he determined not to go back without food. At midnight four days later, he staggered into camp under a load of buffalo meat. He threw it off himself and sank down in a faint. He had neither eaten nor slept for four days. During his absence, his men had given up their last shred of hope. Pike had saved them.

But their suffering continued. Pike would not turn back, and the camp moved southward. Every night the men lay down in the snowdrifts, and when the

sun rose, were surprised to find one another still alive. From time to time, when they had not eaten for several days, they pitched camp, and Pike climbed up into the mountains to hunt. In this way the party crossed the Sangre de Cristo range of mountains and dropped down into the San Luis Valley. It was a relief to be out of the mountains.

Suddenly the expedition came to a halt. A river loomed up.

"But is it the Red river?" wondered Pike.

He crossed it and continued southward. Somewhere along the way he built a stockade. One morning a party of Spaniards galloped into his camp and informed the 'Americans' that the river they had crossed was the Rio Grande, and that they had invaded the Spanish soil of New Mexico.

Lieutenant Pike had not intended any affront to the Spanish Government and hastened to Santa Fe to apologize to the Governor of New Mexico.

In St Louis, headquarters received the following letter one day.

NACHETOCHEO
5th July, 1807

DEAR GENERAL,

Once more I address you from the land of freedom and under the banners of our country. . . .

Z. M. PIKE
Lieutenant

Like Captains Lewis and Clark he had come back to report on the beauty and majesty of the New West, to say to his fellow-Americans, "Come, you pioneers! Pack your covered wagons. Come build a mighty nation on these wild and fruitful plains."

III

John Charles Frémont

The pioneers hearkened to the call and began to respond. Slowly up the river-beds west of the Mississippi they drew lines of settlements. The yellow flood of the Mississippi grew lively with flat-boats and rafts, and in time with the smoking funnels of steamboats. In the villages on the west bank gathered Indians and trappers. They talked of the Wild West. The tales of Lewis, Clark, and Pike were retailed in great quantity. Using a twig for a pencil, and a mud patch in the road for paper, many a wiseacre could illustrate the pathway of the West. Yonder was desert, there was a lake, here a range of mountains. Some of the hearsay geography was true. But some of it would have startled Captain Lewis or Lieutenant Pike.

Legends arose, a fabulous geography of icy peaks and arid sands and dizzy canyons. Hostile Indians and grizzly bears inhabited these regions. Tornadoes and blizzards swept them. The Government knew that before Americans could take their families into the new territory, more mapping was needed. Lewis, Clark, Pike, and others like them, had discovered the general features of the West. Now the details of the picture had to be drawn.

"Let me," volunteered a young Southerner, John Charles Frémont, to the Government. "Let me survey the territory beyond the Missouri river."

John Charles Frémont was a mixture of scientist, poet, and adventurer. He had been born in Charleston, and in the fine mansions there was well known for his brilliant and restless spirit. At school and college,

when most of his classmates relied on their teachers to push them on, the boy Frémont was constantly darting ahead into new by-paths. In his quest for learning he was fearless. Alone and unbidden, he plunged into the deep waters of Greek grammar, botany, chemistry, astronomy. He needed no teacher to guide him; he was a born explorer.

Exploring in books awoke in him the desire to explore in space. At the age of twenty he joined the navy as a teacher of mathematics, and for three years cruised about South America. On his return he was commissioned Second Lieutenant in the Topographical Corps and sent on a survey of the wide plateau between the upper Mississippi and Missouri rivers. That was his first glimpse of the West, and it enthralled him. At home in Charleston, he had all the comforts of a mansion and garden. He had servants to wait on him, and fine friends. He could be safe and happy. But Frémont was an adventurer. The strangeness of the prairie and the river bluffs, of life in an Indian village, of the nightly camp-fire and the flavour of venison roasted on sticks, of French trappers and shaggy buffaloes—all the wonders of the Wild West—fascinated him. That was why, since the Government wanted all the natural pathways of the West mapped, John Charles Frémont volunteered his services. In 1842 the Government accepted, and thus began the career of America's greatest explorer of home ground.

At the head of a caravan of men and beasts, and guided by the famous Kit Carson, Frémont thoroughly scoured the unknown corners of the West. Between expeditions, he went back to civilization in Charleston, and described in glowing words and scientific maps the

exact picture of the country. He described everything, from smells to geology.

His first expedition took him up the Kansas river. Then overland he crossed to the North Platte, and into the Sweetwater. He found himself in a tumbly region and climbed the highest of the Wind River Mountains which his grateful fellow-countrymen call "Frémont's Peak."

Watching Frémont from the tall grass, did the Arapahoe or the Cheyenne brave realize that he beheld the footstep of his doom, the doom of all wild things of the West? He saw Frémont's men race gaily after buffaloes, wreaths of smoke curling out of their guns. Did he realize that he himself was next to fall before the march of white men? At sunset he saw the white men's carts wheeled into a circle. Within this circle tents were pitched, saddles and blankets thrown on the ground. In a little while fires blazed up, and the Indian heard the white men roar with laughter and song. The fire died down. A guard was mounted, and the camp was silent.

The moment had come, the spying Indian sometimes thought, to fall upon these invaders and drive them back from this land.

But most of the Indians remained friendly to the last ditch. For Frémont, as for all brave men, they had great admiration. Once he led his men into the Great Basin between the Sierra Nevada and Wasatch Range. It was in the dead of winter, yet Frémont was determined to cross the Sierras into the Sacramento Valley. The Indians warned him frantically against the attempt.

"In places," they advised, "the mountains touch the heavens." In places the range is 14,500 feet high. "At this moment," they said, "in the mountains all is storm,

rock, and peak. The trails are few, and those few are hidden beneath snowdrift."

Frémont would not be dissuaded. One by one his Indian guides deserted him. The men said nothing, but, as they followed their leader into the sheer ice, their eyes said that they were prepared for the worst. Perhaps it was a miracle, perhaps the genius of John Charles Frémont; but without losing a man, the party at last dropped down into the smiling Sacramento Valley, gay with flowers.

Frémont traversed the same trails that Lewis and Clark, and Pike had blazed a generation before. He did not discover any new territory, but during his several journeys he scientifically mapped all that others had discovered before him. After each journey he came back East; wrote the account of his travels; pointed out the pathways to the wealth of the West. Like Lewis, Clark, and Pike, Frémont had a message for the pioneers. The Wild West was doomed, for over Frémont's routes came the pioneer.

In the East men laid down their tools, sold their farms, their goods. Their eyes glinted with the vision of skins and furs alive in the hills of Oregon. Flushed with the Oregon fever, they were ready to face any dangers on the vast prairies and Rockies. They built their covered wagons, and in these prairie schooners hit the trail leading out of the last outpost of civilization, St Louis. May was the month to start out, when the plains were fresh and green.

As they rolled out waving farewell, the pioneers were a happy lot. The thought that some of them would leave their bones bleaching in the plains never entered their minds. Their hearts were high and their faces ever west. Every night they formed their wagons

in a hollow square. They posted sentries for their horses and cattle. Then under the stars, round a roaring blaze, they drowned the wailing of the coyote with their singing:

Then o'er the hills in legions, boys,
Fair freedom's star
Points to the sunset regions, boys,
Ha, ha, ha, ha!

Across to the forks of the Platte river the caravan pushed. Up to this point Nature was kind with lush grass and easy gradients, dinners roaming wild about them, and breakfasts swimming in the streams. But when they followed the north fork, the trail to Oregon became a hazard of rolling hills. Here the way was hard, but only a warning of what was to come. For it was only when they tumbled through the South Pass of the Rockies that their suffering began. In that long stretch across the dry Wyoming basin lay hunger and thirst in ambush. But if they survived the next week, they found themselves safe at last in the fine pine-woods of Oregon, with its rich soil, gentle meadows, and mild climate. From sheer relief, the pioneer might stop his wagon. "This is good enough for me, boys," he might say, and there was an end of his trek. Here was his home, for weal or woe. A few families agreeing, a colony started, and the ranch was built up.

But if he were still restless with ambition to become another John Jacob Astor, the millionaire fur-trader, on he went to Snake Valley and the Walla Walla country, up to the Columbia river—all the way to the coast perhaps, where lay the trading-post of Astoria. That was the Oregon Trail, west and north of St Louis. You went there if you dreamed of the touch of fine skins.

But if you heard the clink of gold in your dreams, you had to go another way: west and south. From Santa Fe, the only settlement in New Mexico, came rumours of an enchanting country of strange cactus, windy mesas, and the great canyon of the Colorado river.



PRAIRIE SCHOONERS HITTING THE TRAIL OUT OF ST LOUIS

In the winter of 1848 some one in California saw a gleam at the bottom of his wash-bowl. "Gold!" was the cry to the ends of the earth. The covered wagon was hitched up again. From Oregon it turned south; from Texas and New Mexico, north in two hot and dusty trails. A new song was in the air:

O California,
That's the land for me,
I'm off for Sacramento
With my wash-bowl on my knee.

Throughout the West spread a network of travel, and a chain of villages and towns.

One day in 1890 an old man boarded a train in New York. He was bound for Los Angeles. He had with him his wife, and to her he might have said, nodding out of the window as the train rolled over the plains and through the passes in the mountains, "How different it all was then. Buffaloes and Indians and open, lonely stretches. I remember the day in winter when we had to cross the Sierra Nevada, and we were all so afraid——"

In his youth the old man had been an explorer. He was John Charles Frémont.

MUNGO PARK

THE SEARCH FOR THE NIGER

Until five generations ago, little was known of Africa but the rim. Africa was merely the land one sailed round to get to India. Calling-places sprang up along the west coast, and markets for gold, ivory, and slaves. Hence the names: Gold Coast, Ivory Coast. A Scotsman, James Bruce, spent two years in Abyssinia and returned to England with a map of the Blue Nile and an exciting story about the interior of Africa. Interest in Africa awakened. To promote this interest, a few Englishmen formed a club.

A CLUB of men used to forgather in a London restaurant. The waiters knew them well, for they came every week at the same time. Every Saturday a room was reserved for the "African Association," whose meetings were attended by knights of the realm and scientists of the Royal Society. This afternoon its president, who in his youth had gone exploring with Captain James Cook, had an important piece of news for the members of the African Association.

Across the table floated the talk. "Here we are," said the diners, "a band of people interested in one thing: the map of Africa. We send explorers to that most shadowy of continents, but it refuses to be explored. Africa is a hard nut for the hardiest pioneer to crack. Was there ever now so elusive a river as the Niger?"

From Herodotus down, every geographer had wondered about the Niger, a river of hearsay, but no white man had ever seen it. Perhaps there was no such river. And yet it was said that a thousand years before, a

horde of Berber Moors had galloped down across the Sudan, across the Sahara, and along the banks of some great river; had overcome the Negroes and built an empire. From time to time an Arab adventurer rode out of the forest and sang of the glories of Timbuktu, the heart of the empire. They told of Timbuktu, city of golden roofs; Timbuktu, as rich as London; Timbuktu, home of wise men and pride of the Moors; Timbuktu on the banks of the Niger. But to white men, Timbuktu and the empire were hearsay.

"Let us investigate this fable," said the members of the English African Association in 1788. They engaged an explorer, a man who had knocked about the world from one end to the other; who had lived among the Indians; who had sailed with Captain Cook; who had tramped the snows of Siberia alone. No one seemed more fit for the needs of the African Association. To him the president had said:

"Find the Niger, if there is such a river. Map its course. You will have to penetrate the interior of Africa farther than any white man has ever before dared. The thick forest will bar your way. Fevers will beset you. Escaping these hazards, you will be opposed by the cruelty of the Moors who guard the interior of Africa jealously, and plunder all they meet. Good-bye."

The gallant explorer landed on the coast of Africa, disappeared in the forest, and died there.

The African Association had another explorer on the way, a man who had lived for almost twenty years among the Moors.

But no sooner did he land in Africa, than he was forced back to England. The road was unsafe. The Moors were in arms.

Two years passed. Then a British army officer undertook to explore for the African Association.

"Find the Niger," were his instructions.

He, too, disappeared into the forest. He, too, died there. The Niger remained a river of hearsay.

The African Association continued their weekly meetings over the dinner-table, and their wonder about the mysteries of Africa increased. Three times had they attempted to probe those mysteries. They had used a man who was at home in the wildest places on earth, another who had lived in Africa as a friend of the fierce Moors, and still another seasoned campaigner. The interior of Africa refused to be explored.

But one afternoon in the spring of 1793, the president announced that a fourth candidate had applied. That was an important piece of news. The trouble was that he was such a young man, in his early twenties. His name was Mungo Park.

"And Mr Park's qualifications?" asked the members.

In a word, Mungo Park had been born on his father's farm near Selkirk, in Scotland. From the boy's quiet ways and great love of books, his father had felt sure he would become a minister. But at the age of fifteen Mungo said he preferred to study medicine, and was, therefore, apprenticed to a surgeon. No one suspected, beneath his quiet ways, the deep unrest in Mungo's mind. At the age of eighteen he had entered the medical school at the University of Edinburgh. Following his graduation three years later he could not resist his urge for travel, and had spent a year as a ship's doctor in the East Indies. It was on his return to England that the young doctor had heard of the African Association's need of an explorer.

He had seen his great chance for adventure, and grasped at it.

"I told him," reported the president to the members of the African Association, "that resourceful men, more seasoned than he, had lost their lives in our service. But that only seemed to whet his appetite all the more. I employed him, therefore. As to the others, so to him, I said, 'Find the Niger. Past unknown forests and fevers and hostile Moors, past the broken routes of those who went before you, flows the Niger. Find it.'"

II

In June, 1794, Mungo Park disembarked in the Gambia river in Western Africa, where, four centuries before, the Portuguese had first landed. Since that time the merchants of Europe had gone there. At the house of one of these, an Englishman, Mungo Park stopped before plunging into the forest. Immediately the forest struck the first blow at him; it prostrated him with fever. But the young man made the most of his enforced rest by learning the tongue of the Negroes through whose territory he was to pass, the Mandingoes. From his window he could see the natives coming out of the forest, bringing gold dust, elephants' tusks, and slaves. The sick man's fever mounted at the sight of these wretched humans in chains. In Africa, he was told, three out of every four Negroes were slaves.

At last Mungo Park was ready for his great adventure. As his English friends watched his tall handsome form fade into the shadows, they shook their heads. The others, too, had faded out the same way.

The country in which Mungo Park found himself, between the Gambia and the Senegal rivers, was

gloomy woods. By night the shrill cry of the jackal and the howl of the hyena kept him awake. But by day he proceeded pleasantly enough, for the Mandingoes whom he encountered were a good-natured, helpful lot. Kaffirs they were; that is, neither Mohammedans nor Christians. Now and then they stopped the explorer and informed him that he must pay toll for passing through the territory of this king or that chief. On those occasions Mungo Park would be taken to the hut of the monarchs who would perhaps demand as much as twenty-five hundred cowries. Cowries were shells used for money, and twenty-five hundred of them amounted to one dollar. But the Scotsman would protest that the tax was too great, that if he paid all the 'kings' so much he would soon be without a single cowrie. Thereupon a 'palaver' would take place. That meant a long discussion.

"Why have you come?" the Negro chiefs asked Mungo Park.

"For knowledge."

They seemed puzzled. "You have not come for gold? For slaves?" they asked incredulously.

"I have come to see the river Niger."

"Why?" they persisted suspiciously. "Have you no rivers where you live?"

The man of the city and the man of the woods did not understand each other. Their lives were as opposite as the poles of the earth. And the farther inland Mungo Park advanced, the greater grew the difference. At last he came to where the Negroes had never before seen a white man. As he was pushing along one day, he came face to face with two Negro horsemen carrying muskets. One look at him and the Negroes stopped short. The white apparition approached, but panic

had seized the natives, and they fled. When he entered their town of huts, the women and children scampered off in terror.

"I am no monster," coaxed Mungo Park. "I am a man just as you."

From a safe distance they studied him. "If you are human," they argued, "where did you get your blanched skin and enormous nose?" They were reassured, however, and decided the colour of his skin and size of his nose were artificial. "When you were an infant," they maintained, "your mother dipped you in milk, and pinched your nose."

The white man rejoined with a compliment on the beauty of their glossy skin and small noses. But they rebuked his flattery. "We do not like a honey mouth."

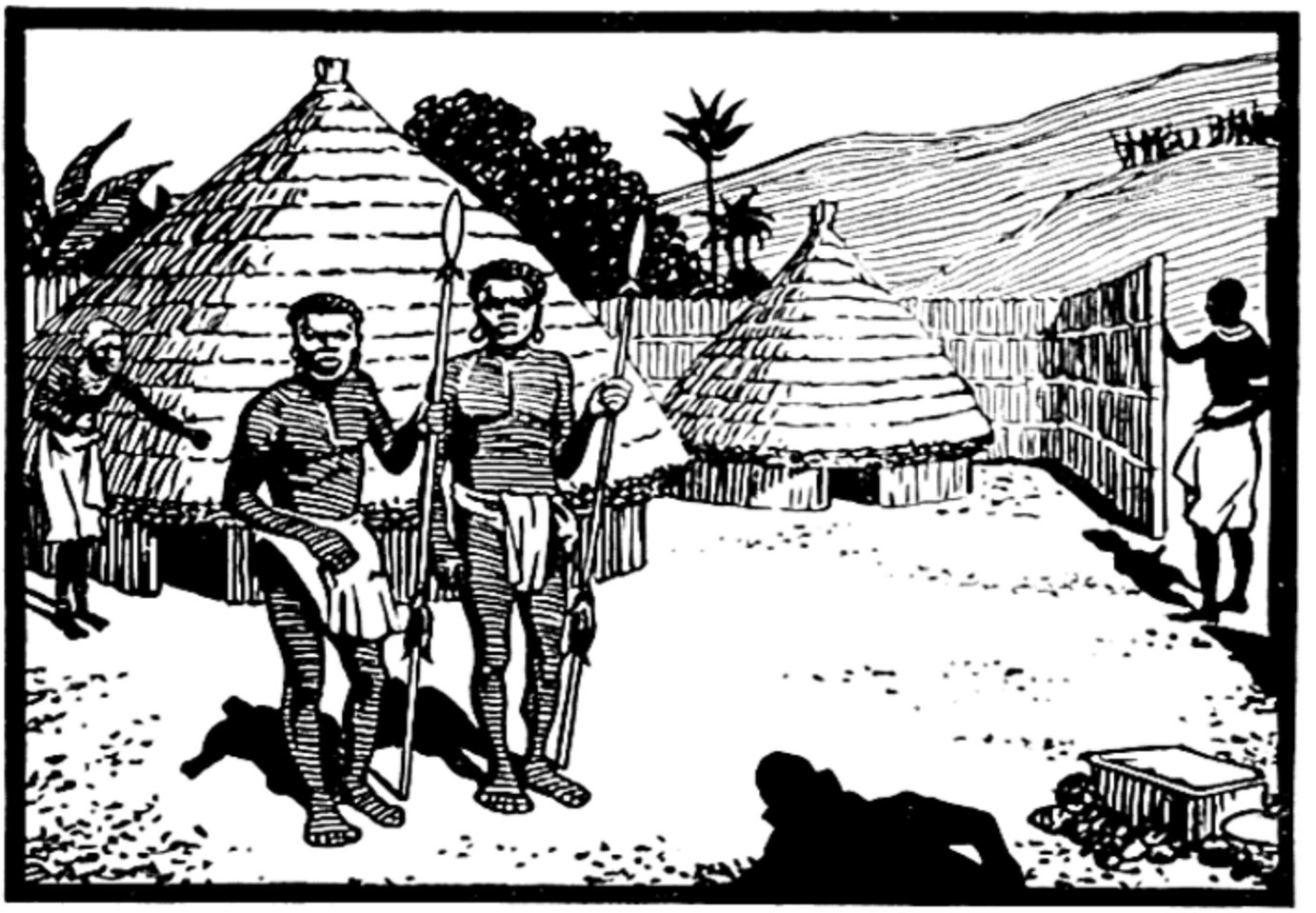
They were gracious hosts, and their kindness to him won his heart. Often in his days of suffering that followed was Mungo Park thankful for the sympathy of the Negro. When stripped of his money by the Moors and, tottering with fever, he had to beg his way, it was to many a Negro slave or shepherd that he owed his life.

He talked with the Mandingoes about the earth. "The world," they believed, "is a wide plain stretching into the dark. Beyond the salt water is the land of the white people. Some distance away lies another land in which dwell cannibal giants. That is the land where the slaves are sold. But of all countries in the world, ours is the best and our people the happiest."

East through the hilly country of the Serawoollies, Mungo Park journeyed safely. But he was nearing the stronghold of the Moors now and thought it safer to travel by night, along with other gliding shadows. He came to the land of the Fulahs, whom he found a

nation of peaceful herdsmen of tawny complexion, with small features and silky hair. At Soolo he paid his respects to the local king, a benign old man.

"For your own good, I urge you to proceed no farther," said the King. "You are approaching the borders of Ludamar, kingdom of the Moors. They



"WE DO NOT LIKE A HONEY MOUTH"

are a fierce race, despising the Negroes they rule, and hating the Whites. They would plunder both. It will probably cost you your life."

Mungo Park went on. Every moment he expected to be set upon by Moorish bandits, but days passed and the only people he met were friendly Negroes. One day he was spending a pleasant morning in one of their huts. He was congratulating himself that all danger from the Moors was over, and that, in another

ten days he would see the Niger. Suddenly the door burst open and a party of Moors entered.

"Come," they ordered. "It is Ali's wish that you be brought before him at his camp."

Mungo Park's agony had begun. For weeks he was held prisoner. The guards neglected to bring him food; they stole all his belongings. Daily he grew more exhausted. "What will they do with me?" he wondered. Some said that the chiefs had decided on his death; others that he would merely have his eyes put out, because he was a spy.

He was attacked by a fever, and lay for days in a coma. To add to his misery, the heat was insufferable, for the camp stood in a desert region. He had feverish visions of the bubbling Yarrow near his home. It seemed to him that he wandered gaily on its green banks; and, as he bent down to drink the cool water, he awoke to find himself a captive perishing of thirst in Africa. If he stayed in his Moorish prison, he realized, he would die. But if he escaped would he meet a better fate? He could, of course, turn back to the coast, but that would mean failure, which was worse than death.

At dawn one day he stole away from his captors. As he tottered on with dim eyes and parched throat, his last ounce of strength ebbed. Water, he needed water. He tore a leaf from a dry shrub, and put it into his mouth. It, too, was dry and bitter. He sank down.

"Here," he thought, "end my hopes." He took a last look round—it seemed odd to die—and lost consciousness. When he came to, the sun was going down. Presently a flash of lightning shot across the sky. He was saved! Spreading his clothes on the

sand, he collected in them the rain water, which he drank by wringing and sucking the clothes.

So was he able to go on until he came upon Negro habitation again. There he got food, shelter, and direction to the Big Water. Seeking the friendly Negroes and avoiding the Moors, he made his way.



BEFORE MUNGO PARK ROLLED THE MAJESTIC NIGER

He fell in one day with two Negro shepherds. "The Big Water!" they repeated. "Come with us. We are going to Segu, which is on the Big Water. You shall see it early to-morrow."

His torment was ended. The following morning, when he had just noticed the smoke over Segu, one of his guides exclaimed, "See the water!"

Before him rolled the majestic Niger, glittering in the morning sun, as broad as the Thames at Westminster.

III

More than two years and a half after he had left England, the gaunt, wasted figure of Mungo Park appeared before the president of the African Association. He had been given up for dead like their other explorers, and they embraced him delightedly.

Yes, he had seen the Niger. There was much to tell. What a pity that he had not been able to map the entire course of the Big Water. Perhaps that could be done later. He had been so ill, and the Moors so menacing, that he had thought it well to turn back and deliver what information he had. Even so, he never could have regained the coast had it not been for the hospitable Negroes. His fever had recurred, and they had nursed him along the way. At Segu, which is situated on both sides of the Niger and has a population of thirty thousand living in clay houses, the people had regarded him in astonishment and fear. But they had given shelter to the sick stranger. Mungo Park recalled with gratitude the kindness of the women in the hut where he lay. They were spinning, and composed songs as they worked. One of them, a sweet and plaintive tune, said:

> The winds roared and the rain fell.
> The poor white man, faint and weary,
> Came and sat under our tree.
> He has no mother to bring him milk,
> No wife to grind his corn.
> Let us pity the white man. . . .

Yes, there was much to tell, and Mungo Park wrote a book telling it. He showed the inside of Africa, the people who dwell there and their way of life. He spoke of the gentle Negro and the fierce Moor who preys on

him. He described a slave caravan marching mournfully in chains for five hundred miles under a broiling sun to the coast where the ships await them. Many of them, he wrote, die on the way, envied by the survivors.

When he finished his book, Mungo Park settled down to practise medicine near Selkirk. But his work as an explorer was not finished. His book startled all Europe. Plans for expeditions into Africa formed. Thought the English merchants, "Perhaps the Niger flows into the sea. If it does, our vessels can sail into the heart of Africa, can reach Timbuktu, and bring us its rich trade. But who will map the course of the Niger? Will Dr Park do it?" The Government wrote to Dr Park.

The fever of the African forest had never left the blood of Mungo Park. His nights were haunted by its terror and lure. He had not intended to revisit the scenes of his agony, but now that the chance came he was gripped with longing to go. He accepted the Government's commission, and in April, 1805, at the head of a force of forty men, marched again into the forests round the Gambia.

No one doubted that what he had once done as a lone traveller, he could do again as the captain of a party of soldiers. Every one had faith in his courage and resourcefulness.

"Though all the Europeans who are with me should die," he had said, "and though I were myself half-dead, I should still persevere; and if I could not succeed in the object of my journey, I would at last die on the Niger."

When one year passed with no word from him, and then another, it began to be feared that he had

succumbed to his desperate resolve to win out or to die on duty. In 1810, five years after Africa had swallowed him, two of his native guides were found by the Governor of Senegal, and the truth came out.

Mungo Park had entered Africa in splendour. Over the same ground that once a sick wanderer had pleaded his way, now marched the leader. His old friends, the Mandingoes, gaped. "Do you remember the white stranger, ten rainy seasons ago?" asked Captain Park, and unpacked his gifts. "This is to show how grateful I am for your former kindness." All went well until fever—the curse to white men in the tropics—attacked the troop. One by one the soldiers dropped into African graves. After each burial, Captain Park said, "Forward." No one saw his own suffering. "I would at last die on the Niger." When he reached the Niger, only a few of his men were alive. Nevertheless, he launched a boat and, as the Government had ordered, rowed down the river.

Near the meeting of Sierra Leone and French Guinea, in a ravine twenty-eight hundred feet above the sea, a tiny spring bubbles. The streamlet trickles and twists eastward. It grows larger. Suddenly it swings north and becomes the home of boats for one thousand miles. Then, rushing to Timbuktu, in fullest flood, it returns to the east. But below Timbuktu, it is broken by a hopeless labyrinth of rocks, islands, and reefs. The Niger roars and foams and rushes on. Well, there Mungo Park fulfilled his own prophecy that he *would at last die on the Niger*. There was a fight. Were the Moors afraid of the white man's competition? Did some one circulate lies about the white captain? Was there simply a misunderstanding? The native guides could not say. But, they said, they saw Captain

Park stand erect in his boat to every inch of his six feet. They saw him, when he could no longer hold out, spring into the rushing torrent, and disappear. . . .

And then the river keeps on its way to the sea. It dips south, and then east, like an L; then down again, until, as the natives say, "The Big Water finds the Salt Water at the Gulf of Guinea."

To-day, the white merchant is a common sight on the Niger, and anyone can fly or motor from Timbuktu across the Sahara to Algiers. And there is an English bridge spanning the Niger, with a bronze plate on it:

TO MUNGO PARK . . .

On the island of Jebba, under the bridge, there are other memorials to the man who pried open the dark, rich country, revealed the great waterway in its heart, and let in the flood of civilization.

In the market-place of Selkirk stands the monumental figure of Mungo Park, high on a pedestal. Below his figure, the artist has sculptured four African figures taken from the explorer's book: a weeping slave-girl, a minstrel, a mother and child, and Superstition beating a tom-tom. He has also depicted two startling moments: one, when Mungo Park, spent with hunger and disease, is pitied and helped by Negro women; the other, when the map-maker first beholds the river Niger.

DAVID LIVINGSTONE

IN DARKEST AFRICA

Now another great Scotsman helps with the map of Africa. Business men were often responsible for exploration; so were missionaries. David Livingstone was of the latter class. From Cape Town he crossed the Kalahari Desert. He was the first white man to behold Lake Ngami. But his greatest work was done on the Zambezi. Like a native he lived in the heart of Africa. He mapped the Lakes Nyassa and Tanganyika. This is his story.

AT the age of ten, when most lads are romping about in the bright sunshine, David was already leading the grim life of an adult. He dressed by candlelight; he hurried in the grey chill morning, not to school or to a cheerful playground, but to a cotton factory in the town of Blantyre, Scotland. That was his school, and a good school it was. His work began at six in the morning. Perched on a ledge of the spinning jenny he tended was a Latin grammar he had bought out of the first few shillings he earned.

"*Hic, haec, hoc* . . ." muttered David as the machine whirred.

At eight o'clock in the evening, he shut his book and rushed off to night school. One of the most fascinating studies to him there was geography. To David it was like a magic carpet on which he floated to the ends of the world and back again—by ten o'clock. Up to that hour he could alight on the steppes of Asia, spend an hour in the polar regions, climb on the back of a llama in the mountains of Peru. The world was his playground.

Here and there on the maps of his geography reader was a strange expression, "Unexplored." That annoyed David. Unexplored! The word was like a door shut in his face; like the door he shut when he scrubbed his mother's floor. He closed that door because he did not want it known that he did a girl's work.

Africa, especially, annoyed him. Its interior was marked "Unexplored." Here the magic carpet was of no use to David. He had to fly over the dark area.

"Why is Africa a secret?' he brooded. "What kind of people are there? Are there any factories in Africa where strong men like me can work and study Latin, too?"

He had a delightful thought. If he went to an unexplored place, it wouldn't be unexplored any longer. And if the people there had no places to study in, maybe he himself could teach them and help them just as he helped his mother. He would be a missionary and help them in the conduct of their lives. If the natives were sick, he could make them well. But then he would have to be a doctor, wouldn't he? Very well, study medicine he would, and——

It was ten o'clock, time to run home to prepare his lessons for the next night. By the light of a tallow candle he studied until midnight. Then his mother came down and took the book away from him. She knew that he needed sleep as well as knowledge.

II

Africa was mostly an unknown land. Thanks to Vasco da Gama and a few others, the coastline was a fringe of settlements. But it was like an edge of light round a pool, from the depths of which rose

feverish vapours and legends of pygmies and unicorns. A few brave souls, indeed, had ventured out into the dark regions. In 1804 there had been Mungo Park. But he had died there. Africa seemed to be the white man's grave.

Dr Livingstone knew this long before he landed at Cape Town on the southern tip of Africa in 1841. But what he did not know and what he now saw with his eyes, cut his soul to the quick. Daily out of the jungles came files of chained men, women, and children cowering before their captor, the slave-trader. To add to Livingstone's anguish, there were tales of slave-ships which, when they were chased by the law, were purposely sunk with all their human cargo. The easiest escape for the poor slave was sickness. Then he was thrown overboard in mid-ocean.

"Africa," cried Livingstone," is a night troubled with the frightful dream of slavery. Let us march into the jungles and bring the dawn."

His listeners at Cape Colony looked coldly at him. "There is nothing wrong with slavery," they said.

There were some, of course, who felt as Livingstone did about slavery. But they only talked. Livingstone determined to do something.

With his sextant and telescope, a few books and medicines, he struck out northward. He scorned warnings about the savage tribes. "The only savages here are the white race," he said, thinking of the slave-dealers. "I have faith in the natives."

At Kuruman he won the first reward of his faith. The native Hottentots welcomed him heartily. He put down his pack and looked about him. Sickness he saw, and ignorance of the ways of civilization.

The essential things, however, were there: good hearts, good heads, and pleasant dispositions.

"Excellent!" thought Livingstone, rolling up his sleeves. "Teach them and cure them, and a great people is added to the world."

He went about among them, with his medicines and kind words. He taught them to tend their plants and grow better ones.

"What is the use of planting," said they, "when we have no rain? Are you a rain-maker, too?"

One of the most important men in the tribe was the rain-maker. He prepared charcoal made of burned bats, jackals' livers, baboons' and lions' hearts, and serpents' skin; chanted his magic formulas; and expected rain to fall from heaven.

Yes, Livingstone was a rain-maker, too. "You don't have to depend on magic," said he, and he showed the Hottentots how, by making a network of ditches, they could draw water from a stream a mile away to make their plants grow.

With Livingstone looking after them, the Hottentots began to feel safe and happy. He was never idle, for he was carpenter, gardener, doctor, and teacher. His wife Mary tended the garden, baked, cooked, and conducted a sewing-class.

"Master" they called him, and all the honour and love they felt for him was in the word. "Master" they persisted in calling him, even though Livingstone protested that he was a friend, not a master.

At last there were good works and order among the Hottentots, and the urge came over Livingstone to carry his mission onward. As his pupils saw him gazing northward, a great fear grew in them. "Stay with us, master," they pleaded. "The Bechuanas to

the north are not so peaceful as we. They will do you harm."

Livingstone shook his head sorrowfully. "You do not know the Bechuanas. That is the reason you fear them. You must come to know your neighbours and you will not fear them."

"At least let some of us go with you," they begged. "We would give our lives to shield you."

Livingstone consented. A tramp of a hundred miles brought the party to the village of the Bechuanas. Almost immediately there was work for the doctor. The little daughter of Sechele, the chief, was sick, nor could all the charms and herbs of the tribal medicine-man cure her. There were no bounds to the gratitude of Sechele and the wonder of the Bechuanas when the white doctor restored the girl to perfect health.

Sechele and Livingstone struck up a fast friendship. The grave, sensible mind of the chieftain was a source of lively pleasure to the missionary. Together the two friends often conversed of peace among the various peoples of Africa. Together they walked forth on still mornings in the bright meadows where the cattle were feeding. They watched the women coming from the river, their watering-pots poised gracefully on their heads; men sewing under the banyans or repairing the hedges.

Beyond lay the Kalahari Desert. On the far side of the desert, Sechele told his friend, were the huts of the Zulus.

"There you must never go," said Sechele. "The Zulus know not the peace of the Bechuanas."

Livingstone denied this. "You fear the Zulus because you do not know them. Fear comes from ignorance. I shall certainly go to Zululand. There is

no danger. In England they say it is rash to be here in this spot with you. And yet I live here, and I have friends."

Sechele knew his friend's modesty. At that very moment Livingstone was suffering from a torn shoulder, the result of a struggle with a lion. The lion was dead, but Livingstone never boasted about it. He disliked people who talked about themselves.

One day a message came to Sechele from the chief of the Zulus, beyond the Kalahari Desert. "I, Sebituane, have heard of the great white teacher, The Livingstone. I have heard how wise he is and I am eager to meet him. If he will not come to us, I will go to him."

Livingstone was delighted, and arranged for the meeting in Zululand at once. It meant a journey across a desert, through unknown lands, perhaps through hostile tribes. At times the expedition ran short of water. The expected water-holes were not found, or else were dry. At other times they found themselves in a country of water-melon vines, or of trees, fragrant bushes, and flowers. They heard the screams of the elephants as they came in herds to drink by night. "The Livingstone" crossed the land of the ostrich, of the straight-horned rhinoceros, and of the hippopotamus. He saw what no white man had ever before seen: a beautiful water antelope, brownish yellow in colour.

And then came a wide detour, an attempt to avoid the dreaded tsetse fly, whose peculiar buzz when once heard can never be forgotten. It is not much larger than the common house-fly, is brown as the honey-bee, and has yellow bars across it. The bite of the tsetse fly, although harmless to wild animals and man, causes certain death to the ox, horse, and dog.

Meanwhile, Sebituane, chief of the Zulus, hearing

of Livingstone's coming, was marching more than a hundred miles to welcome him. The Zulu chief had sent his men ahead to prepare a place for Livingstone's camp. When the missionary met Sebituane, the greatest warrior of southern Africa, he was immensely impressed by the chief's hospitality.

He was impressed with the entire Zulu nation. He had never expected to find them so honest and industrious, nor such superb craftsmen with metal. Nor had he expected to find so jolly a crowd as their neighbours, the laughing Bushmen.

"A great people," he concluded. "And a beautiful country, if only its fevers were rooted out."

As for the African friends of Livingstone, they would have worshipped him had he permitted it. His fame flashed electrically through the secret places of the continent like a rustle of breeze through its jungles. His address was simply "Dr Livingstone, Africa." At Cape Town his white friends knew nothing of his whereabouts. "Perhaps he is dead of a fever or a spear," they said, "somewhere in unknown Africa." But if they handed a letter for Livingstone to a native of Cape Town, it reached "The Livingstone," no matter where he was. From hand to hand it passed, from tribe to tribe. From the shores of Cape Town into the forest it sped. A Makololo carried it swiftly to a Bechuana, the Bechuana gave it to the Zulu whom he hated. The bonds between them all was "The Livingstone."

When Livingstone stepped among them, he found the tribe waiting for him as for a holiday, with the chant on their lips:

I see the white man
I see the comrade of Sebituane . . .

Every one was delighted. For Livingstone, the man of peace, was with them.

All this time Livingstone was erasing, bit by bit, the word "Unexplored" from the geography of Africa. He was charting, locating, bounding, and always on



LIVINGSTONE FOUND THE TRIBE WAITING FOR HIM AS FOR A HOLIDAY

the look-out for new features on the face of Africa—lakes, rivers, mountains.

One day he pushed aside some shrubs and there before him rolled the fine, majestic waters of the Zambezi, as his Zulu friend, Sekeletu, called it, flowing in the middle of the continent.

"Let us launch our canoes on it," said Livingstone excitedly. "Let us explore it." Some native guide was ever ready to accompany him anywhere.

For days they paddled in the soft sunlight. On either side the banks were covered with rich vegetation and spangled with blossoms. Feathery palms stood clear against the sky; also the silver beech and dark cypress. Over all towered the burly baobab, each of whose enormous arms was like the trunk of a large tree.

Then one day—"Look!"

In the distance, five columns of vapour were rising straight up into the clouds. A deep roar came to the ears of the explorers.

"The smoke-that-sounds," the natives called it.

Livingstone slid to the verge of the falls where, peering down, he saw the mighty Zambezi, two thousand yards broad, leap down a precipice and rush on, boiling, through a canyon hundreds of feet deep. He looked down at the white rolling mass from which arose the dense white clouds. He looked up, and saw two shining rainbows.

"Sometimes there are four rainbows," said his guide.

Livingstone thought a while. "I shall call it after the Queen of England," he announced. "It shall be 'Victoria Falls'!"

He went on discovering and charting, without rest, the magnificent lakes, Ngami and Nyassa, twenty-one miles long; mountain ranges and rivers; the climate and the soil; animals and plants. Livingstone was making the map of Africa. His work was so accurate that Sir Thomas MacLean, the Astronomer Royal, said, "As far as I know, Livingstone is the first traveller who has made such accurate observations. You can go to any point across the entire continent along Livingstone's track and feel certain of your position."

In addition, Livingstone had become a great zoologist while in Africa. Throughout the vast and unknown regions over which he travelled, his observation of wild life was remarkable. Zoologists expressed their admiration for him by naming three species of birds, three species of quadrupeds, and a reptile after him.

Thousands of miles he tramped through wilderness and desert, cutting the pathways of Africa. Between Linyante and Loanda on the Atlantic coast he was laid low with fever twenty-seven times. He was sometimes too sick to eat.

"Go back to England for a rest," the English consul at Loanda pleaded, as he saw Livingstone's pale face and uncertain gait. "England needs you. You are a famous man there. They will give you prizes. Go back home for your honours."

When he returned to England to rest, Queen Victoria interviewed him. The Royal Geographical Society presented him with a gold medal. Throngs crowded his lectures to hear about his work in Africa. But despite the world's acclaim Livingstone was uneasy, for he had promised his African friends that he would come back.

So in his forty-sixth year, David Livingstone disembarked on the east coast of Africa, his face towards the jungle again, his mind intent on his friends and his home—the Africans and Africa.

"What is the course of the Lualaba when it leaves its lake?"

"How can the crops of the Zulus be increased?"

Thus pondering, Livingstone again disappeared from view of the world.

III

October 16th, 1869

To HENRY M. STANLEY
Madrid, Spain

Come to Paris on important business.

(*Signed*) JAS. GORDON BENNETT, Jr.
New York Herald

Hastily collecting his clothes and packing his bags, the young reporter took the express train for Paris. When he arrived there late at night, he went to the Grand Hotel and knocked at the door of Mr Bennett's room.

"Come in."

Stanley entered.

"Ah, yes. Sit down, Stanley," said Bennett. "I have important business on hand for you. Where do you think Livingstone is?"

"I really don't know, sir," replied the astonished journalist.

"Do you think he is alive?"

"He may be, and he may not be."

"Well," said Bennett slowly, "I think he is alive and that he can be found, and I am going to send you to find him."

"What!" cried Stanley. "Do you really think I can find Dr Livingstone? Do you want me to go to Central Africa?"

"Yes. Look for Livingstone. Get what news you can from him. Perhaps," he added slowly and thoughtfully, "the old man is in want. Take enough with you to help him should he require help. Of course you will act according to your plans, and do what you think best . . . *but find Livingstone.*"

That was how Henry M. Stanley, reporter for the *New York Herald*, came to find himself at Zanzibar, on the east coast of Africa. From this point, he took up the trail of Livingstone, while the world waited breathlessly for the results of his search.

Into the trackless interior Stanley worked his way. "Where is Livingstone?" he kept asking the natives.

One day, as he entered the village of Ujiji, a voice from the midst of a crowd of natives said, "Good morning, sir!"

Startled by the English greeting, Stanley stared at the woolly head and grinning face of the speaker.

"Who are you?" he asked.

"I am Dr Livingstone's servant."

"What! Take me to him."

A few minutes more and Stanley was face to face with Livingstone.

"Where have you been all this time?" Stanley asked. "The world has believed you dead."

In the depths of the jungle, where New York and London were legends of another world, the two white men clasped hands and talked.

Stanley gazed at the man at whose side he was sitting in Central Africa. He was fascinated by Livingstone's account of his work in Africa. Livingstone said, "Now, tell me the general news. How is the world getting along?"

The young reporter told him that the Suez Canal had been opened to the commerce of the world; that the Pacific Railroad had been completed; that General Grant had been elected President of the United States.

It was the beginning of a friendship. But the wearied look, the heavy step, which told of age and hard

travel, the bowed shoulders of the explorer shocked Stanley. The old man seemed sick.

"Doctor," said Stanley, "you are not well. You must go back to England."

Livingstone smiled and shook his head. "I cannot give up making a complete work of my exploration," he said. "Besides, I must keep working with my last breath to cure that open, running sore of the world—slavery. This great continent is a vast man-hunting ground where the slaves are often tortured to death. When will my trembling African people not have to watch for the midnight slave-raider? When will the spear be carried as a defence against wild animals only? The civilized world must remove this blot of slavery. Take back this message with you. I stay."

But he did not stay for long. He did go back to England soon—lifeless. He had given his last ounce of strength for his glorious cause. Slavery, though not entirely abolished by his efforts, came to be recognized as disgraceful.

Livingstone's life was a great adventure told excitingly in his writings—*Missionary Travels and Researches in South Africa*, *Narrative of an Expedition to the Zambezi and Its Tributaries*, *Last Journals of David Livingstone*. These books are Livingstone's story and will be read as long as there are people who love freedom of mind and body.

RICHARD FRANCIS BURTON

THE THOUSAND NIGHTS AND A NIGHT

The most ancient mystery of Africa has been the river Nile. Herodotus tried to solve the mystery. Strabo explored it. Ptolemy guessed at its source. For about seventeen hundred years after him, geographers continued to guess at the source of the Nile. James Bruce helped matters. Then Richard Francis Burton thought he would try to find it. Sir Richard is better known, however, for his map-making in Arabia. There he learned to travel in disguise, to rush into daily danger with his finger on the trigger or sword-hilt. He was the most dashing adventurer of modern times.

NOT long ago—in 1850—there was a huge white blot on the map, called Arabia. What the blot hid was a mystery. Who dwelt within it, what the face of the land was like, were dark secrets. Now and then a caravan of Moslem pilgrims would march out of Yambu on the Red Sea and fade into the desert. And the desert was silent.

Somewhere in that huge blot were the sacred cities of Medina and Mecca. Entrance within their gates was forbidden on pain of death to any but a Moslem. About these cities lay the desert, parched and swarming with robber bands.

Mr Cole, the English consul at Jedda on the Red Sea, spoke with many Mohammedans on the subject of exploring unknown Arabia and clearing up the huge blot on the maps. The Moslems merely shook their heads at such talk.

"We English can do it," Mr Cole said.

His hearers shrugged. An Englishman could do a

great many things, they agreed. But he could never enter Medina or Mecca. He would die in the attempt. If the desert did not exhaust him completely, the brigands, lurking in the hills of the desert, would slay him. Lastly, if he were lucky enough to escape these deaths, he would be torn to pieces within the cities. No, no, let be the huge white blot, for "East is East, and West is West, and never the twain shall meet."

One of Mr Cole's countrymen, Richard Burton, was a young scholar and adventurer. For ten years or more he had studied Eastern peoples, their manners, customs, and languages. He spoke twenty-nine different Oriental languages so well that, if he were properly disguised, he could pass for a native almost anywhere in the Orient.

Burton saw the blot on the map.

"Shameful!" he exclaimed, as he vowed to clear it up.

II

On April 4, 1853, a young Persian prince—at least he looked like a prince and said he was one—embarked on the steamer *Bengal* sailing to Alexandria from Southampton, England. The prince was tall, his cheek-bones prominent, his complexion swarthy, and his mustachios envied by all very young Englishmen. The prince himself spoke no English, and since no one on board spoke Persian, he remained a silent prince the voyage long.

No sooner did the ship dock at Alexandria, than the prince hurried away. Anyone following him through the twisted streets would certainly have been struck by a queer incident. One day the prince entered his lodgings never to issue forth again. Instead, a dervish,

a wanderer of the desert, stole out of the prince's lodgings carrying some baggage on his shoulder. He was tall with prominent cheek-bones and flowing mustachios.

At the docks Moslem pilgrims to the holy cities were waiting for a boat to take them first to Cairo. They noticed the dervish.

"What is your name, O Father of the Mustachios?" they asked him.

"Abdullah," was the reply. "I am from Afghanistan."

Up the Nile to Cairo the pilgrims sailed. Then, in a body, they trudged across to Suez. At Suez they were packed into a small boat, which, amid creakings and shoutings, set out on the Red Sea for Yambu on the Arabian coast. The dervish Abdullah was a silent figure, except when addressed. At first the rest of the pilgrims were a bit suspicious of him, but when they heard his wise words, they began to like him.

"A sage and holy man," they whispered.

When the pilgrim ship had been several days out at sea, it was anchored one night close to the shore. At dawn, the pilgrims found that the tide had ebbed and the boat was stranded. There was nothing to do but shove the boat out into the water. Shove they did, but all their efforts were of no avail. All the morning they pushed and strained in vain. The dervish stood off, watching their frantic efforts. Suddenly he noticed the tide flowing in and the vessel yielding. Cunningly he approached the heaving mob.

"When you hear me pronounce my words," he said, "heave with all your might."

Raising his hands, he chanted: "Ya Piran Pir! Ya abd al-Kadir Jilani!"

The mob strained, the boat dipped, a wave lifted it, and once more it floated on the tide.

"A miracle!" said the pilgrims in awed tones.

At Yambu the ragged pilgrims formed a caravan, and with their camels and dromedaries stepped forth into the desert. Across this lay Medina. Oh, the terrible desert! That sea of sand! The sky is a pitiless blinding glare. The mouth glows; the skin is parched. The sky raises up pillars of sand which, like jinn of the waste, advance towards you monstrously. The Arab stretches out his finger at these jinn and exclaims defiantly, "O thou ill-omened ones!" The simoom, a hot violent wind laden with dust, breathes on the cheek like a flaming breath of a tiger.

The little caravan was approached by brigands several times. Each time, however, it succeeded in squirming its way onward. The dervish earned a curious reputation in these encounters. When the pilgrims reached Medina they said to the natives, pointing to the Father of the Mustachios, "Do you know what he did?"

"No."

"Well, the other day some robbers surrounded us out there. They showed us death, and what do you think he did?"

"How do we know! What *did* he do?"

"He called for his dinner."

That was enough to endear him permanently to the Arab's heart, for the desert loves a brave man. But the people of the holy city would not have been so cordial to the dervish, perhaps, had they seen him secretly writing his mysterious notes and making drawings. In the dead of night, or whenever he was alone, the Father of the Mustachios was constantly

writing and hiding away his papers. Fortunately, his hosts loved him too much to suspect him.

With tears and presents they said farewell to him at last, when he left Medina for the sacred Mecca.

Again the perils of the desert, the bullets of brigands! But the dervish was silent and unafraid, and continued to call loudly for his supper. "In my country, Afghanistan," said he, "we mind not the jackal of the desert."

"Thou hast spoken truth, O gracious one," said his listeners.

Safely therefore came the dervish to Mecca. The city was like a vast Moslem bazaar. The pavements swarmed with a motley crowd; here a Bedouin, there a Hindu, yonder a Turk. Over all towered the minarets of Mecca. The dervish drank it all in. His pencil scrawled secretly.

Abdullah stepped into the office of the British Consulate in Jedda. The servant, contemptuous of the Afghan, did not think that Mr Cole could see him. The dervish held out a note. Humbly he beseeched that Mr Cole be given the note.

In a short while the astonished servant returned to say that Mr Cole would see Abdullah in the private office. Abdullah quietly followed into the presence of Mr Cole.

"Richard Burton!" cried the consul.

The dervish nodded wearily.

III

Back in England, Burton was no sooner up from the task of writing his *Personal Narrative of a Pilgrimage to Al Medinah and Meccah*, than he looked about

for a new adventure. As a knight in quest of danger, he could not bear the tame life of London. Dinners in his honour and polite speeches bored him.

"Oh, for the solitude of the wild place, the peace of the desert, the excitement of the strange face, the sound of a strange tongue!" he wished.

The Royal Geographical Society came to his rescue.

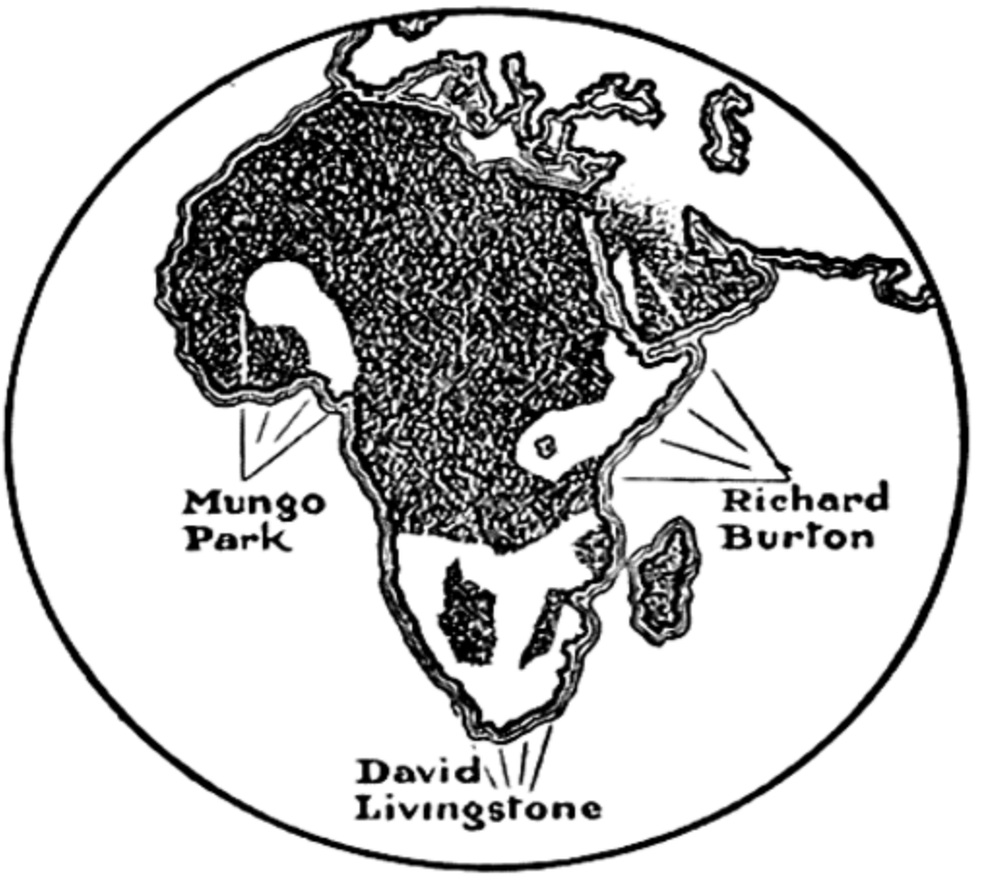
> There are hints [said the scholars], of a busy life in East Africa, the part called Somaliland. Who are its people, what lives and what grows in its plains and in its forests? We hear of an ancient walled city in its interior, Harar by name, once the capital of a mighty race. It seems to be the headquarters of the slave trade and the coffee trade. But that is only hearsay. The slaves, who are shipped to the coast from out its dark walls at less than a dollar a head, speak of a strange language and of an ameer who forbids all strangers entrance to his city. You, dear Burton, so expert in clearing up blots on the map, are the one man for this task. No European has ever been there, and our Government will not protect you. Will you take your life again into your hands?

As fast as he could Burton went to Arabia. In the British colony of Aden, on the southern coast of Arabia, he made his preparations.

"To Harar?" exclaimed his friends in Aden. "Horror, indeed. It is a forbidden city surrounded by desert plains. There is a limit to rashness. Even you will not escape death."

Such talk only added zest to the adventure. Burton disguised himself as an Arab merchant this time, at the head of a caravan of horses, mules, and camels. Then with his troops, as his friends threw the slipper of good luck at his back, he boarded a boat to Zaylah, the outpost of Somaliland on the east coast of Africa.

On the bright clear tide, the Arab servants of Burton showed themselves to be true sons of the open spaces. They doffed their clothes and smeared their bodies with fat. Under the moonlight they rested on mats, smoking their pipes made out of goat's shank-bone. They slept on deck and there gobbled food, wiping their greasy fingers on their ankles.



OPENING UP AFRICA

Among the whitewashed houses and yellow sands of Zaylah, Burton found a curious mixture of people. In colour they ranged from jet black to olive.

"They are all kind to me," wrote Burton in his note-book, "but the Negroes especially are merry, soft, and affectionate. They delight in dancing, and sing to the accompaniment of the drum and the clapping of hands. The poetry of their songs is very good, for the people are all poets here. Everybody has a fine

ear for rhythm. And they take poetry so seriously that a bad rhyme makes them indignant."

But one cannot eat poetry, and Burton wondered how Zaylah earned its living. Except for some women weaving mats, no one semed to work. He knew that the Arabs called Zaylah the "Land of Give-Me-Something." Yet who gave? As he wandered out of the low brown wall of the town, he found the answer. He came upon tents of the Bedouins, the "Sun-dwellers," as the Arabs called these riders of the plains. These supplied Zaylah with the products of the desert.

To mingle with the Bedouins was Burton's chief delight. They were generous and hospitable to him, but stared long at the colour of his skin.

"The white man! The white man!" the children shrieked. "Run away, run away, or we shall be eaten by him!"

Fathers threatened their disobedient youngsters with the jaws of that ogre, the white man.

After a supper of rice and dates, seasoned, on some rare occasions, with a pinch of salt which was the food of millionaires, the men would chat. Talk was life to them. Suppose a Bedouin rides forth to the well for water. When he comes back, he meets a few companions. If they should ask him, "What's the news?" Burton has said that the conversation would go like this:

"It is good news."
"Even so!" His hearers nod.
"I mounted mule this morning."
"Even so!"
"I departed from you riding."
"Even so!"

"*There* I went."
"Even so!"
"I threaded the wood."
"Even so!"
"I traversed the sands."
"Even so!"
"At last I came upon cattle tracks."
"Hoo! Hoo! Hoo!!!"
"They were fresh."
"Even so!"
"So were the earths."
"Even so!"
"I distinguished the feet of women."
"Even so!"
"But there were no camels."
"Even so!"
"At last I saw sticks . . ."
"Even so!"
"Stones . . ."
"Even so!"
"Water . . ."
"Even so!"
"A well!"

One night, as they were enjoying the cool breeze after the heat of the day, a rider came in to announce that the road to Harar was closed; a dead man had been found on the way, and smallpox was raging on the plains that stretched between Zaylah and Harar. Smallpox!

"Now you must stay with us," said the Bedouins triumphantly to Burton. "You cannot go on."

Burton smiled.

"But surely you will not!" cried his servants. "We will not go. Life is too dear."

The merchant shrugged his shoulders. "I will go alone, if necessary," he said.

"Woe!" they moaned. "We are dead men."

Before them rose the wooded mountains, purple and silver in the moonlight. From out the mysterious depths, the hyena howled its laugh, and the breeze carried the unearthly shriek of the jackal.

IV

The way to Harar lay sometimes on the open plain and sometimes in the gloom of a forest. The plain was sometimes made pleasant by cool wells and freshets banked with the green, graceful tamarisk, the thick jujube, or the gum-giving acacia. By moonlight the wells were haunted by strange forms. Now a troop of gazelles stepped daintily up to drink; now the lumbering elephant. The shadow was that of a lion pacing about, or of an ostrich strutting, or perhaps of a snake streaking the sand with its trail. Sometimes it was the most fearful of monsters, the leopard, who has been known to follow a file of travellers in the wood, with stealthy tread, leap out and strike down the last man and drag him away to his lair.

At the head of the little band rode Burton, his rifle cocked across his saddle. All went well until from a hill they saw a dark speck far in the yellow stubble.

"Harar!" he shouted.

His men became cold with fright. "Turn back!" they beseeched.

"He who desires, may desert me," said Burton. "I go on."

They took him at his word, and all but two turned back.

Boldly Burton entered the gates of Harar. "I desire

audience with the ameer," he demanded loudly. He objected when they commanded him to take off his shoes in the palace. He objected when they asked him to leave his revolver behind. He objected and bullied. And his bullying took effect. The men of Harar were cowed.



"HE WHO DESIRES, MAY DESERT ME. I GO ON"

The ameer, or Sultan Ahmad bin Sultan Abibakr, sat in a dark room on a raised cot. Around him ranged his court.

"Peace be upon ye!" saluted Burton.

He threw off his disguise. "I am a European," he announced boldly.

Narrowly he watched the ameer. If he smiled, all was well. If not . . . The ameer was frowning.

"I have come from Aden to bring to you the

compliments of our governor," Burton went on in Arabic. The ameer's brow was dark.

"I have come to Harar to gaze on the light of your Majesty's countenance."

His Majesty was silent.

"I convey to you our governor's wish that our two nations may learn the ways of peace and friendship." The ameer smiled, and his smile was like the light of the sun to Burton.

That night, as he lay down on the hard matting in the ameer's house, Burton, too, smiled a contented smile.

V

The world has never boasted a more adventurous soul than the scholar, Richard Burton. Wherever an unexplored spot of the world appeared on our maps, he was restless to invade it and explore it. Always among strange people, he carefully studied their speech, habits, and way of life. Thus he learned to speak in twenty-nine different tongues as flawlessly as he spoke English.

For years at a time Europe lost sight of Burton. Then suddenly one day he would appear in Europe out of unknown lands, haggard with suffering. And as he rested a while, he wrote down his adventures, his new facts about geography and the life of hidden nations.

After the trip described in *First Footsteps in East Africa* came the brave journey which resulted in Burton's greatest discovery. Scholars had long wondered, "What are the sources of the Nile?" Most people guessed, but Burton thought grimly, "The Nile must be tracked down." He packed up, and off

he went. Along with him went his friend, John Hanning Speke. The Nile must have laughed slyly as it lay coiled in its bed. Down into Central Africa the two explorers tracked it, and in February, 1858, they found themselves in a region of lakes. Here Burton discovered the immense sheet of water known as Lake Tanganyika; and Speke, while Burton lay sick, discovered Lake Victoria Nyanza, the source of the Nile. The book which Burton wrote celebrating the discovery is *The Lake Regions of Equatorial Africa*.

All his life Burton continued his exploration: in Africa, in western United States, in Iceland. To record all his adventures he had to write about eighty books.

Then, as a scholar, he made the most delightful translation into English of the *Arabian Nights*, called *The Thousand Nights and a Night*, and the best translation of the Portuguese Camoëns' *Lusiads*, a poem about another great adventurer, Vasco da Gama.

Well has it been said that Richard Burton crowded more adventure and study into one lifetime than is usual in ten.

ROALD AMUNDSEN

FINDING THE NORTH-WEST PASSAGE

The most perilous of all exploration is that of the Arctic regions, and the human race has paid for its knowledge of those regions with the lives of some of its finest explorers. Henry Hudson, Vitus Bering, John Franklin—their names are on the map where they left their bodies. It was to find a northern route to Asia that first led European ships into the frozen wastes. Almost four centuries after Henry Hudson, a Baron Nordenskjöld found the North-east Passage. Now the map-makers turned their attention to the polar regions with the questions: Where exactly are the Poles of the Earth? What are the polar regions like? Is there a continent in the Antarctic? To find the North-west Passage and map the Poles were the ambitions of the youth, Roald Amundsen.

HENRY HUDSON lost his life seeking the North-west Passage. Before him, John and Sebastian Cabot spent a good part of their lives seeking it in vain. And that most successful of explorers, Captain Cook, was baffled by it.

Although he knew this, Sir John Franklin in 1819 did not hesitate. For the English Government said, "Somewhere to the north, between Newfoundland and Greenland, must be a direct passage to the East. If you find it, twenty thousand pounds and immortal fame are yours."

"I shall try," said Franklin, "and if I die in the attempt to further man's knowledge, it will be in the company of brave men."

He sailed through the treacherous passes of northern Canada, through blizzard and fog. Then, in weather

so cold that the mercury in the thermometers froze, and tea in their teapots became ice before they could drink it, Franklin and four companions set out on the land.

To protect themselves against the weather, the men wore fur caps, leather coats, and trousers, heavy stockings and moccasins. They travelled on snowshoes, which, although necessary for snow-covered ground, meant much suffering for those unaccustomed to walking on them. To carry their supplies they used two sledges, made of a few flat boards, curving upward in front, and drawn by dogs.

They had to live by their daily hunting and fishing. For five weeks they wandered slowly across stretches of barren land and over high and rugged hills, each man carrying one hundred and eighty pounds of supplies, including a canoe. On the icy waters of the river that led to the Arctic, they found themselves hurled down the stream, over rocks which would have wrecked the helpless canoes, had they struck the jagged edges. Then along the rock-bound coast of the Arctic their canoes tossed in a tempestuous sea.

Franklin surveyed the coastline. "A North-west Passage to China exists, and we shall sail through it," he said.

Overcome by fatigue and weakened from lack of food, they struggled on. A violent storm arose. The men shivered under their blankets in their frozen tents, about which the snow was piled. The food supply was low, and the long Arctic winter had returned. For days a violent storm of wind and rain beat on them. Franklin retreated.

> We had no means of making a fire [he wrote in his journal], the moss being covered by the ice and snow.

> On being exposed to the air, I became quite faint with hunger. . . . We commenced our cheerless march. The ground was covered with snow a foot in depth, and we had to pass across swamps and marshy places, sometimes stepping up to the knee in water, and at others on a slippery stone which often brought us down. The men who carried the canoes had a most laborious task. They frequently fell down. The best canoe was so damaged as to be rendered wholly useless.

II

Near the town of Oslo, in Norway, a fifteen-year-old boy was so thrilled by the book he was reading that he did not hear his mother calling him to supper. The book was Sir John Franklin's account of his polar journey.

"For four hundred years the bravest English explorers have tried to go through the North-west Passage and failed," the boy said to himself. "The bravest of all was Sir John Franklin and he, too, died in the attempt. But that North-west Passage must be conquered. For whatever remains a mystery is a burden to all men. I shall solve the mystery of the North-west Passage."

From then on, Roald Amundsen began to prepare for the life of an Arctic explorer. This meant that he must train himself to endure every hardship. The only sports then in Norway were skiing and football. Roald liked to ski, but he did not like football. Nevertheless, since it hardened his muscles, he played the game as enthusiastically as the greatest lover of that sport.

Meanwhile he was devouring all the books on the Arctic regions he could lay his hands on.

"Why has not man been able to conquer the North-west Passage these three hundred years?" he wondered. "Since Sebastian Cabot and Henry Hudson thought of reaching Asia by sailing west over the northern route, generations of hardy Arctic explorers have steered their ships that way. Always barriers of ice blocked them. Yet they were the bravest of pioneers. Why did they fail?"

Amundsen found out. There was the long Arctic night, which meant months and months of patiently waiting in the dreary wastes of ice and snow, with frightful winter cold and piercing winds, and darkness relieved only by the moon and the northern lights. He read of ships frozen in between great walls of ice that held them prisoners until spring set them free. For the ship's crew this meant scurvy and hunger, if they were fortunate enough to survive the Arctic winter. When the sun finally broke up the surrounding ice, there were only a few short weeks left of summer to go forward or back. But often the warmth of the Arctic summer was not sufficient to clear the channel. At the end of the season, the explorers would then find their ship imprisoned in the ice a few miles from their previous winter quarters, short of food.

"These explorers were certainly courageous," Amundsen decided. "But we need something more than bravery. We must plan ahead and prepare every detail in our expeditions. That is how we can conquer the North-west Passage."

Thereupon he began training himself all the harder. For instance, he studied navigation. So good a student was he that by the time he was twenty-five, he was chosen first mate on the *Belgica*, which was sailing for the Antarctic to study the South Magnetic Pole. On

the way, the boat coasted along Tierra del Fuego, where the commander gathered specimens, mapped the coastline, and took meteorological observations.

Now a bitter experience awaited the young explorer. As the expedition proceeded to South Victoria Land, they were caught in an ice-field. For thirteen months the ship was frozen in. Two of the sailors went insane. To add to the misery, at one time every one on board ship was affected with scurvy.

From his reading Amundsen knew that scurvy could be cured by a change of diet. The only fresh food obtainable was fresh meat. To get that meant travelling for miles over ice in search of seals and penguins. But he brought back the cure. Within a week the health of the crew improved.

When he returned to Europe, Amundsen equipped himself further by studying magnetism and meteorology, for he wished his explorations to be of value to the world. He, therefore, went to see Von Neumayer, a German scientist, about his studies.

The scientist greeted Amundsen and asked him his business. Amundsen explained that he wanted to be an explorer, that he had had two years' experience with an Antarctic expedition, and that he must learn more about making magnetic observations.

"Young man," replied the aged scientist, "you have something else on your mind! Tell me what it is."

"I want to be the first to conquer the North-west Passage."

"Ah, a fine ambition. There is still more."

"Well," said Amundsen, "I have wanted to locate exactly the North Magnetic Pole."

The scientist arose, came over to Amundsen, and threw his arms round him in a warm embrace. "Young

man," he said, "if you do that, you will be the benefactor of mankind for ages to come. *That* is the great adventure."

During the night of June 16, 1903, in the midst of a blinding rainstorm, seven men boarded the fishing smack *Gjöa*, tied to a wharf on the coast of Norway. The hawsers cast off, the prow of the *Gjöa* turned to the great adventure.

For days the *Gjöa* cut quietly through the waters until, at length, it reached Beechey Island. Here Amundsen took magnetic observations to locate the North Magnetic Pole. The observations showed it to be on the west coast of Boothia Felix.

They entered Peel Sound.

"From here on," Captain Amundsen told his gallant crew of six, "nobody has ever ventured. We have no charts to go by. We must therefore constantly take soundings, and make our own maps as we proceed. Anything may happen to us."

Everything happened. A mad gale seized them and frisked them as a child does a penny toy. On one side the sea heaved them to a dizzy height; on the other it yawned and showed jagged rocks, like teeth in a vast grinning skull. Crash! The keel ground on the rocks. It seemed all over with the brave *Gjöa*. But no! Another swell, like a mountain, swept the boat off the rocks.

The men rushed out to search for a leak.

"We are saved," they cried joyfully. "There is no leak."

Suddenly the helmsman groaned, "Captain, the rudder is damaged. We are drifting helplessly."

The men shuddered. All at once a wall of water sent them sprawling. As they struggled to hold on a little

longer for dear life, the helmsman shrieked, "She steers! She steers again!"

The wave had knocked the rudder back into place! They were safe for a little while longer. But they clung to life so firmly that neither sea nor rocks nor the Arctic ice could down them.

September found them cruising in Rae Strait. The Arctic night was drawing on, and it was time to set up winter quarters. As he scanned the horizon, Amundsen spied King William Island and a beautiful sheltered harbour, safe from storms. Here the explorers built a snug camp for themselves, and kennels for their dogs.

Their boxes were now taken ashore and unpacked. The cases were made of boards cut from the most carefully selected lumber. They could use them in building their magnetic observatory; Amundsen had had them built with copper nails, since iron ones would affect the magnetic needles. He had even brought with him slabs of marble on which the scientific instruments could be mounted precisely. These marble slabs were set with great care on a firm rock foundation. Captain Amundsen had provided himself with a complete set of the most accurate instruments.

The following days were spent laying in a supply of fresh meat. One day Amundsen and two of his men were out hunting when one of them exclaimed, "There is a caribou!"

They all looked. On a distant hill a black object had appeared.

"That caribou walks on two legs," remarked one of Amundsen's companions. Four more two-legged caribous joined the first, and in a body five Eskimos advanced. They were armed with bows and arrows,

but Amundsen ordered his own men to throw down their rifles, as a token of friendliness. The Eskimos hesitated a moment. Then the leader uttered a gruff command, and they all threw away their bows and arrows.

Amundsen welcomed them to the ship, showing them the marvels of its equipment. Thus began a friendship which was to last for the length of Amundsen's stay. The explorer always treated his Eskimo friends with the greatest consideration; and as for them, they worshipped him. The Eskimos asked if they might not bring their tribe and settle near the ship. Soon fifty Eskimo huts sprang up round the explorer's camp, housing a population of about two hundred men, women, and children.

This was the opportunity Amundsen had been seeking. For when he planned the expedition, he hoped that he would have the good fortune to study the customs of the natives. Perhaps he might succeed in acquiring a complete collection for a museum, illustrating every aspect of the Eskimo's life. Amundsen had therefore brought many things for the purpose of barter, and before he bade his Eskimo friends farewell the set of exhibits he collected contained samples of suits of clothing worn by them, their cooking implements, their bows and arrows, spears, sleds, and canoes.

"What skill they have!" admired Amundsen. "Especially in working caribou skins into clothes. How cleverly their beadwork is fashioned, made from the teeth and bits of dried bone of the caribou!"

What fascinated him most was the way they stretched and twisted the bones of freshly killed game into spearheads, needles, and other very useful articles.

While Amundsen went about charting the coast of King William Land, his scientific needles kept recording day and night the queer behaviour of the neighbouring Magnetic Pole. As every navigator knows, the compass does not point true north; it points rather to the Magnetic Pole. In days past, when he had sailed through Peel Sound round Prescott Island, Amundsen had been made aware of the near presence of the Magnetic Pole by the fantastic way his compass acted. Finally, the compass had become paralysed. They might as well have tried to steer through the fog by a stick, and it was a miracle of genius that the little party had found their way at last to King William Land. For nineteen months during the expedition of 1903–1905, Amundsen's instruments were active, and at length proved what scientists had long suspected, that the poles of that great magnet, the earth, are not fixed spots, but that they are for ever shifting their ground.

The rest of the North-west Passage was still to be found. In August, 1905, the explorers again set sail, heading through Simpson Strait. Amundsen had calculated carefully how the mysterious passage must wind, but he could not tell whether he had passed through it except by the sight of whaling vessels. That would tell him he was along the northern coast of Alaska at last.

Day after day for three weeks, the *Gjöa* crept along the dangerous shoals of the Straits. Amundsen was constantly sounding the depth with the lead, seeking a channel to carry him through into the known waters to the west. No one had charted this shallow passageway before. At one time the *Gjöa* traversed one portion of the channel with just one inch of water to spare beneath the keel.

Amundsen was torn with doubt. "It is true," he thought, "that I have laid my plans carefully. But so did the other explorers who perished here." He could neither eat nor sleep. Every nerve was strained as he strove to avoid the dangers that had swallowed up John Franklin and the rest.

"I *must* succeed," he told himself.

Then one day came the welcome sight. "A sail! A sail!"

He *had* succeeded. In the west, the glorious sight of a whaler enchanted his eyes. Alaska! Of the numberless possible channels winding between the maze of islands off the northern coast of North America, Amundsen had selected the right ones. The North-west Passage from Europe to Asia was mapped.

III

A greater adventure was to come.

Amundsen began to lay plans for a heroic risk—the discovery of the North Pole! Hundreds of brave men had died in the attempt, and Amundsen realized that he might add to the list of the dead. Truly Nature was guarding this secret with every weapon—with blizzards, fogs, terrible cold, scarcity of food, and the long polar night. Nevertheless, Amundsen, the scientific explorer, had weapons, too.

But just as he was ready to begin the struggle, news reached the world that the North Pole had been discovered. The American, Robert E. Peary, had won the prize, and the struggle of four hundred years to reach the North Pole was ended.

Amundsen was not disappointed. "There still is work for me," he said. "I shall be the first to reach the

South Pole. I shall have an opportunity to study Antarctica, a continent probably larger than all of Europe. There is much work there for an explorer."

Antarctica, the seventh continent, was practically unknown before the beginning of the twentieth century. Captain Cook had crossed the Antarctic Circle in search of it, and was deterred from sailing onward only because his vessel was not equipped for the Polar Sea with its cold and its icebergs. Cook had, however, predicted truly that such a continent existed.

Amundsen knew that a study of the climate of this ice-covered continent would be of greatest help to the science of the weather. His stay in Antarctica would hence be an extremely busy one. He would note the temperature, take magnetic observations, and map as much of the surface of the land as he could, while he was attempting to reach the South Pole.

In August, 1910, he was ready. During the Antarctic summer, he arrived in the Bay of Whales, in the South Polar regions. There he faced the problem of choosing a place for his camp.

"The air currents in the Antarctic make the weather much more severe on the land than on ice. We shall, therefore, camp not on the land but on this glacier," Amundsen explained to his men. "And its high walls of ice will protect us from the terrific blizzards of the Antarctic with its world's worst climate."

But some scientists had said that camping on a glacier was certain death, because at any moment the ice might split and float away.

"Yet," thought Amundsen, "here is a part of the glacier which is caught fast. It has not moved, as I have read, for sixty-eight years. It seems safe enough."

He was right; a cosy little home the glacier made.

The scene was beautiful in its vast whiteness. A clear sky and a glorious moon revealed the glistening landscape. Here and there a seal slouched about on the ice. The aurora shone brilliantly.

The time came for the great march to the South Pole. But Amundsen did not undertake to do it all at



AMUNDSEN SET OUT FOR THE SOUTH POLE

once. That would be too dangerous, for hundreds of miles separated him from the Pole, and, like other explorers, he might starve to death on the way. No, he had a cunning plan. All along the way he set up small camps stored with provisions and marked with flags and signposts so that they could be found later even in dense fog. Then he returned to the main camp, rested, harnessed up his dogs, and set out.

The plan worked perfectly. He reached the South

Pole on December 14, 1911. There he camped for three days and explored the neighbourhood for ten miles round. Then he returned with perfect ease and safety, his camps along the way supplying him constantly. In ninety-nine days he had made a journey of eighteen hundred and sixty miles through a maze of glaciers, over plateaus ten thousand feet high, and across perilous crevasses. The expedition had been scientifically planned.

In everything he did, Amundsen was the scientist. For instance, much exploration was still needed in the North Polar regions. Thought Amundsen, "The day of the slow vessel and the slow dog-sledge is over. I shall go to the North Pole in an airship. From the air I shall be able to survey the entire region of the Pole, and make my observations of the land and the winds more easily and truly."

So the world owes another debt to Amundsen. He and his crew were the first to fly over the North Pole in an airship, the *Norge*, and to bring back the information scientists wanted.

IV

In 1927, Amundsen wrote a book. In it he said, "My life as an explorer is closed. My honours are great. But there is nothing more that I am able to do."

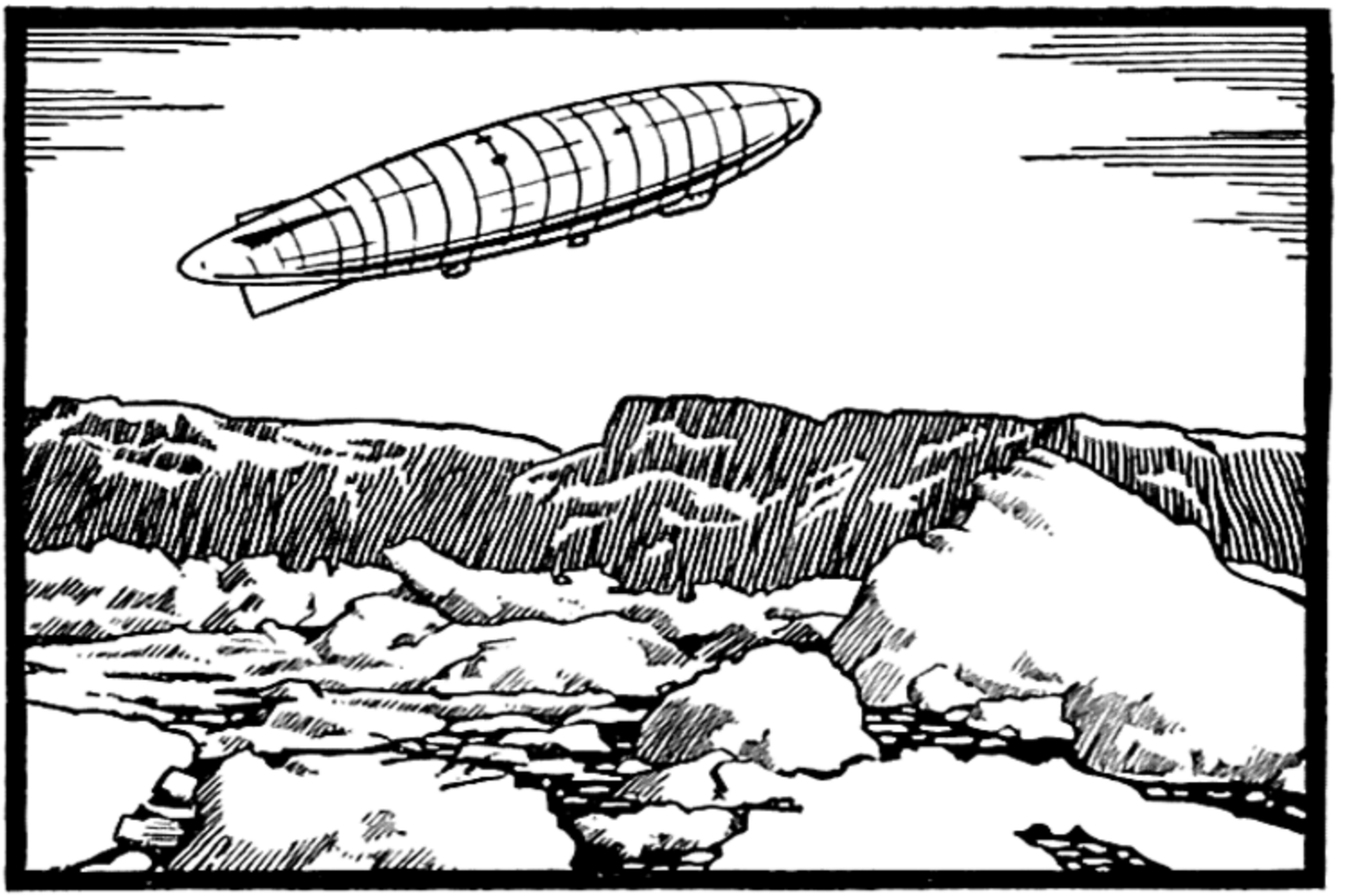
He was wrong. His greatest deed of heroism was yet to come. And for it, the world will for ever revere the man even more than it will the explorer.

In 1928, a member of the crew of the *Norge*, Nobile by name, went independently of Amundsen to the North Pole in the airship *Italia*. For a time all seemed to go well with him. Every day radio messages from

the *Italia* assured the world of its safety. One day the messages suddenly ceased.

"The *Italia* is down!" flashed across the newspapers.

Nobile and his men were perhaps dead somewhere in the Arctic regions. There was a bare chance that they were still alive in the ice fields. Who would risk



"THE DAY OF THE SLOW VESSEL AND THE SLOW DOG-SLEDGE IS OVER. I SHALL GO TO THE NORTH POLE IN AN AIRSHIP"

his life to find them? Several searching parties went out immediately. Days passed, and the searching parties reported that they could not locate the unfortunate Nobile.

"If only Amundsen would go!" everybody prayed. "Only he can save the wrecked men."

Amundsen did not need to be asked. Although he

was fifty-five years old and the doctors had forbidden him to face the rigours of exploration any more, he felt that he could not allow a human being to perish if he could help to save him.

The world watched Amundsen mount his aeroplane and soar northward into the sky. As he disappeared from view, every one felt the greatness of the hero. For a while there was no news. Then suddenly one of the many searching parties sent the triumphant message, "Nobile saved."

The world rejoiced. The search was ended. But where was Amundsen? Why did he not come home too? Why did he not send a message? Every question was met with the frozen silence of the North. The world grew alarmed.

"Never fear," some said confidently, "there is no force that can down Amundsen. He who conquered the North-west Passage and the South Pole does not die so easily."

Months passed without a trace of him. Governments sent out expeditions in search of him. Every country wanted the honour of saving him. In vain. At length, when every region of the Arctic seemed to have been searched, the world gave up in despair and mourning.

His body has disappeared from the face of the earth. There, in the Arctic World, where his life work began, it ended.

PART III

Finding New Worlds

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ALEXANDER VON HUMBOLDT

THE NEW CONQUEST

The word 'geography' means a description of the earth. But when explorers have mapped the surface of the globe, will the science of geography be finished? If so, the end is in sight. For in their aeroplanes our living explorers are now at work mapping the last unknown spots in the Arctic, in Africa, in Arabia. The surface of the globe, however, is but one field of geography. Here is what geography meant to Alexander von Humboldt.

THE moon poured its light on the plantain leaves. It flowed on the broad river.

From the deeps of the jungle broke the hoarse cry of a jaguar, "*Pu, pu.*"

As in fear the tree tops gave forth a monkey's chorus of shrill whistling. The chatter of the birds was as bright as their plumage. Suddenly, a deep bellow.

"Crocodile," said the Indian guide. "Look!"

By the light of the fire the white man looked and saw, stretched out along the brink of the river, a troop of horny-skinned crocodiles, like fallen logs, with wide-open jaws.

The white man sat up in his hammock. "Why," he asked, in Spanish, "is the forest so full of sound?"

The Indian shrugged his shoulders. "Its creatures," he replied, "are keeping the feast of the full moon."

"Why does the white man ask so many questions? Why has he come?" wondered the Indian. Surely for no good. The white man had never been good to the natives of South America. What did they want, this white man and his friend, with their questions, their

papers, their books? They were kind; they were brave. The long sting of the gnat they bore without complaint. They were not afraid of the stare of the jaguar. To lead them over the waters of the Orinoco, they paid their guides without bargaining. Their barque was stocked with birds and beasts and plants picked up along the way. And all day, it seemed, the younger man wrote on sheets of paper. "Why?" wondered the Indian as he sank back in his hammock.

At daybreak the jungle was silent but for the men launching their canoe. It was not three feet in width. Yet four paddlers crouched in the prow. The stern was covered with a roof of brushwood, under which the two white men kept their belongings. The roof was hung with cages of monkeys and birds. Here and there lay bundles of dried plants.

"Humboldt," said one white man to the other, in French, "we must be near the fork of the Orinoco."

"Then," answered Humboldt, "we are near the end of our journey."

The river was full of black, granite rocks, and the canoe wound its course slowly. Sometimes the tops of the huge rocks leaned together, arching the current. Other times, the boat jammed against the rocks and a man had to leap into the water to help it along.

Sprawled in the narrow barque Humboldt wrote, "The Orinoco is crossed by a chain of mountains."

One evening they came upon a native village celebrating the festival of the harvest of brazil nuts, and the white men were taken to the banquet-hall. This turned out to be a hut without table or bench. Against the walls were placed the delicacies of the occasion, roasted monkeys and palm cabbage. The white men were not hungry.

The men formed a ring with clasped hands. A dance followed. The musicians wheezed upon reeds their sad melodies. They kept time by bending their knees or swaying from side to side. To this rhythm the ring of dancers turned solemnly—first left, then right—for hours without stop.

"How did you find the zancudos during the night?" the villagers asked their white guests the next morning.

That was the customary greeting.

More feared than the jaguar, who rarely molested men, the zancudo was a sort of gnat. At nightfall the air would begin to hum. Then, ouch! A zancudo had struck its sharp sucker into human flesh. The swelling had begun. The natives were always slapping themselves and one another.

"How did you find the zancudos?" asked the Indians sympathetically.

Swollen hands and faces were the answer.

The canoe pushed off with its freight of jungle specimens, a native, and two white men. The rocks, black and frowning, rose from the water. Tangled forests swayed through the mist. In the evening the spray was shot through with bows of colour. The palms and ferns nodded in the breeze.

"You will go up," a native had told them, "first, the Atabapo; then, the Temi. When the current of black waters drives you back, you must carry your boat across through sunken forests. Then, if your boat is not broken to pieces, you will launch it on the Río Negro, and paddle south-east as far as San Carlos. You will presently find yourself pushing north on the Casiquiare. At last you will be back on the Orinoco, but this time on the Upper Orinoco."

"I," Humboldt had said to him, "am trying to map

the exact course of those rivers, especially the Casiquiare, which joins the Orinoco with the Amazon. But most, I think, I should like to find the spot where the Orinoco forks out into two branches."

A month passed; a month of steaming forests, of zancudos, of crocodiles; a month of still jungle days and nights when the jaguar howled, "*Pu, pu!*" and monkeys whistled with fright, the bright birds screamed, and the night turned to noise.

But one afternoon when Humboldt was on the watch, the jungles on both sides seemed to fall away. The river was growing wider.

"Look," he called to his friend. "The fork! The fork of the Orinoco!"

The Indian gazed impassively.

II

Meanwhile, in the fine cities of Germany and France, scholars waited eagerly for word from Alexander von Humboldt. Several years had passed since, in 1799, the young man of thirty had left for South America. His brother got an occasional letter from him, and then the news of his exploits travelled to the university halls and the drawing-rooms of Europe.

"What a pity!" some exclaimed. "He was having so brilliant a career with the Government."

Humboldt, as a Government officer in Germany, had invented a lamp which made it safer for men to work down in the mines. Then, just when his star was rising on the political horizon, he had resigned.

"Too bad," said others. "Too bad he was struck with the notion to become an explorer. He would have had a brilliant career as a zoologist."

Humboldt's studies on the nervous system of animals were well known.

"He seems to have been most interested," his friends pointed out, "in geology."

The young man was indeed a gifted scientist. Even as a small boy in Berlin he had shown promise of a scientific career. Just as some boys collect marbles or picture cards, Alexander would collect shells, or plants, or insects. Then he would label them neatly and arrange them.

"Little apothecary" his friends had nicknamed him.

A time came when the spirit of adventure seized hold of the growing boy. He would steal hours from his studies to read travel books. A map before him, he would trace with his finger the shadows of this mountain chain, the zigzag of that river, and would see himself climbing, hacking his way, fighting torrents, exploring the solitudes of nature.

"Alexander!" It was his tutor, or his mother. He must study his Latin, or eat his dinner, or do something.

He read of Ferdinand Magellan fighting his way through the seven seas. "There was a hero!" he thought wistfully. To the rich lad, living in a castle at Tegel, the thought that he might never see the Magellanic Clouds in the sky sent a pang through him. He read of Balboa, climbing the peak in Darien, rapt in wonder at the gleaming new waters beneath; of Cortes waving his plumes in the land of the Aztecs; of Pizarro in the land of the Incas. He read a book by a man named George Forster, who had sailed round the world with that beloved explorer, James Cook.

"Oh," wished the youth, "if I could meet one of these explorers!"

He did. At the University of Göttingen he met George Forster himself, and the two became fast friends. The fragrance of the South Seas rose languidly in their talk. The sea spume drenched and refreshed the spirit of Alexander von Humboldt. Perhaps he had believed that an explorer must be a rough, big sort of fellow; gallant but rough, big of muscle, and dashing to the ends of the earth only for the love of adventure. But George Forster was not of that kind. He was highly educated, especially in science, and as gentle as a lamb. Humboldt's hopes for himself as an explorer leaped.

"No," said Forster, "we no longer need explorers like Cortes and Pizarro. They were not really explorers. They were conquerors. They never cared to throw light on the shadows of the earth. They wanted the conquest of the earth. For gold they destroyed the empires of the Aztecs and the Incas. For gold they died. Explorers must be scientists, not adventurers; peaceful men, not warriors. They are those who want to find out what they can about the earth and its people. They must be furnished with scientific instruments, not guns; with knowledge, not greed. Cortes and Pizarro, for instance, never wondered what plants or animals lived in the jungles of South America or the mountains of Mexico. As explorers they failed, because they taught us little of the regions to which they went. No, the new explorer must be geologist, astronomer, botanist—a scientist."

That settled it. Alexander von Humboldt, brilliant student of science at the University of Göttingen, could be an explorer. Nine years later, equipped with every sort of scientific apparatus and accompanied by a friend who was a botanist, he sailed in the ship *Pizarro* for the coast of South America.

Years were passing. The scholars of Europe missed Humboldt. "Where is he?" they asked.

"The jungles of Venezuela—the Orinoco," was the answer. "He has proved that the Amazon and the Orinoco rivers are connected. He has mapped the fork of the Orinoco. He is discovering nature in Venezuela."

His fame grew in his absence. Scholars were impatient to examine the wealth of new knowledge he had uncovered. "Is he on his way home?" they asked. But Humboldt's letters did not speak of home, not yet. He was in Cuba. . . . Then in South America. He was crossing the swollen stream of the Magdalena. He was climbing the peaks of the Cordilleras. His note-book was growing fatter and fatter.

III

Chimborazo, never mounted by mortal, its summit neighbour to the stars! One morning in June, 1802, a group of figures on mules were clambering up its ridges.

From time to time Humboldt glanced upward, but the peak of Chimborazo was shrouded in heavy mist. Below them, the plains of yellow grass, which had dropped off one by one, lay like strips of carpet. How high had they come? He consulted his barometer. Ten—eleven—more than fourteen thousand feet.

"No one," remarked Humboldt to his friend, "has ever yet climbed so high."

The rocks rose in columns, like tree-trunks in a snow-field. "We must leave our mules," said one of the guides.

The party moved on, but one of the Indians stopped. "I go no higher," he said.

The path became steeper and narrower. Shortly Humboldt again shot a glance at his barometer. "Sixteen thousand feet," he announced airily. The snow lay about them, thick and blinding.

"I go back," said another Indian sullenly.

Only one guide was left. "*Adiós*," said Humboldt. Another moment and the man was lost in the solid mist.

The path was very, very narrow; on one side of it a chasm of empty space, on the other a slope of ice. For greater safety, the men began to crawl on all fours. The rock cut into their hands and crumbled under their feet. The trail was streaked with blood. Humboldt opened the barometer. The mercury indicated a height of 18,380 feet. The peak of Chimborazo was still out of sight. The scholars struggled on.

Suddenly Humboldt found himself breathing hard.

He stopped. "How do you feel?" he gasped.

For a moment he heard no reply. His head swam. His mouth felt warm and sticky; his gums were bleeding. Then faintly, as though across worlds of space, he heard his friend retching. He himself felt like throwing up.

A huge condor swooped and sailed by.

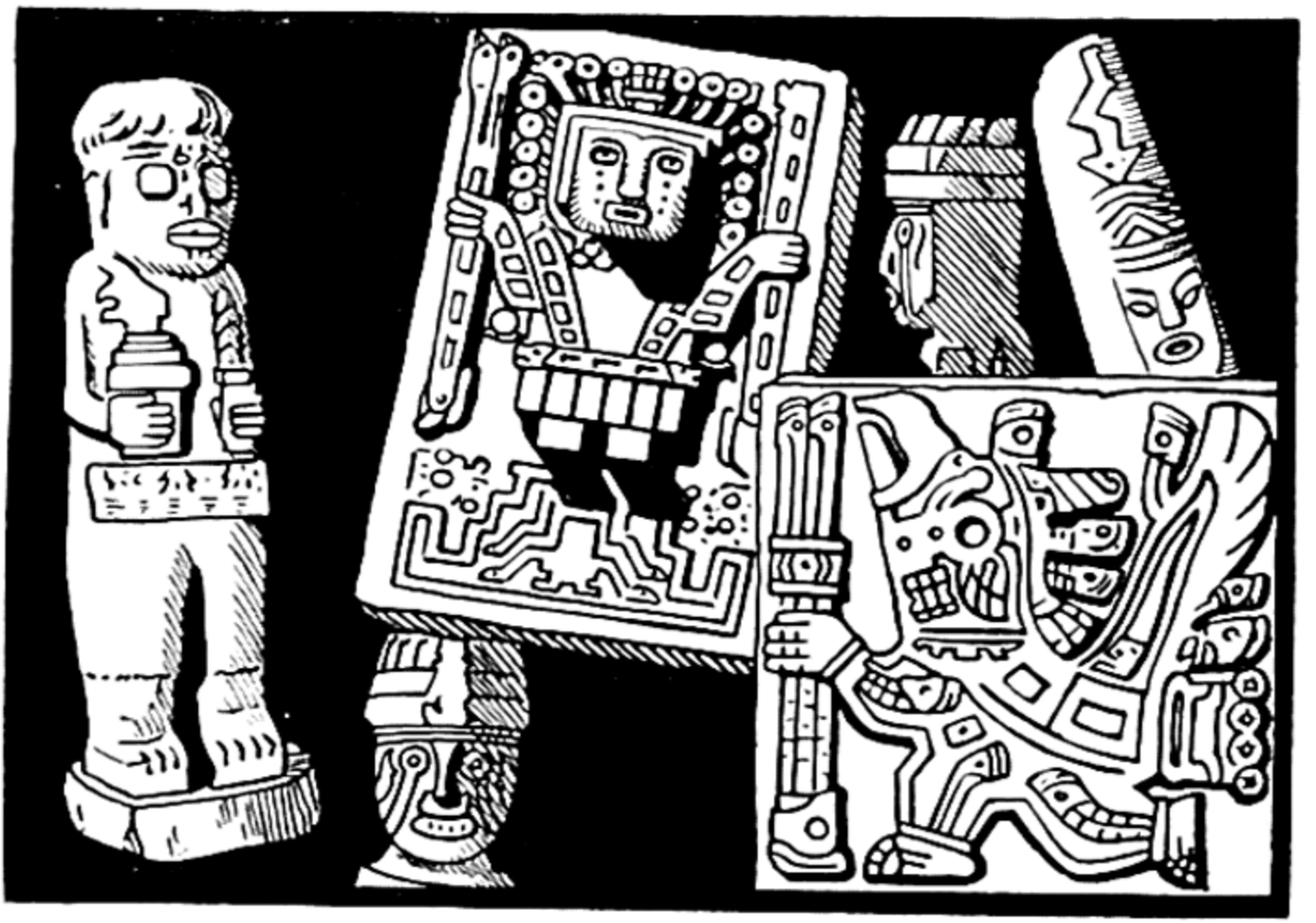
"How high are we now?"

As he stooped to open the case of his barometer, he was struck with the strangest, most incomprehensible sight. A fluttering yellow butterfly. He stared. He felt like saying to it, "Well, and what are you doing up here? How is your stomach in this rare atmosphere? Do you realize we are 19,200 feet above the sea?"

He put out his hand cautiously. But he dared not move on the narrow pass and his hand felt numb with cold. The specimen escaped. He would not forget to mention it in his note-book.

He looked up. "There!" he cried. The belts of cloud had rifted apart, and the vast dome of Chimborazo stood clear and near to them. "Another five minutes and we shall win to the top," he encouraged his companion.

Up he began to scale the rocks, his eyes swollen



HUMBOLDT HAD SEEN STONE CARVINGS AT CUZCO

with blood. All at once the path ended on a rocky ledge and the men found themselves on the brink of a chasm. Across the gulf was the summit of the mountain; but without wings Humboldt could not attain it. He stooped to pick up a specimen of rock.

"Let us turn back," he said, as he put the rock in his kit. Hail was falling.

Far below them lay the region that was once the capital of the ancient Incas. The Incan empire

extended through the present Ecuador, Bolivia, Peru, and beyond. "People of the sun" they called themselves, ten millions of them.

"They must have been a remarkable race of people," thought Humboldt. He had seen at Cuzco stone carvings and buildings unsurpassed in the world. He had seen metal work and pottery of amazing skill. But the outstanding marvels of Incan relics were their roads and bridges, for they had been the greatest engineers of old America. Humboldt had examined their suspension bridges across bottomless canyons, bridges with powerful cables anchored to holes cut through rock. He had seen ravines walled up by Inca masons of almost superhuman skill. Huge tunnels, and thousands of miles of perfect roadway over the most rugged backs of the Andes were witnesses to the brains of the Incas. With their simple tools they quarried blocks of stone, tons in weight, and hewed out dwellings and statues. An ambitious people were the Incas. And an artistic people. Their beautiful pottery jars and finely woven cotton goods were the evidence. They had had surgeons and dentists and fine lawyers and great poets.

Their empire was no more. When he thought about it, Humboldt kindled with indignation. "Think of it. Three hundred years ago a fine race of people lived happily in the valleys and on the table-lands of western South America. Along came the white Spaniards led by Francisco Pizarro—brave men all, but cruel and treacherous to the friendly natives. And then, for the sake of a yellow metal, the barbaric whites conquered and destroyed the Inca nation."

The same tragedy befell Mexico, Humboldt knew. He later went to Mexico, where he climbed the hill of

Chapultepec, and, sweeping his eye over the plain, dreamed that once again it was peopled with the bygone Aztecs. As his vision rested on the canal of Ixtacalco and Chalco, he seemed to see the vanished floating gardens quivering in the wind.

Radiating from the palace of Montezuma had once been the prosperous towns of the Aztecs. Their markets had displayed every form of wealth, from gold to feathers, and that had been their undoing.

One day the Spaniards, led by Hernando Cortes, had marched in. The Aztecs were gracious, even generous to their guests. But the sight of so much loot had overcome the scruples of the whites, and the Aztec empire had fallen, another victim to the whites' greed.

Humboldt rummaged in Mexico among the Aztec ruins. He, too, was to carry loot back with him. But his conquest—how different from that of Cortes and Pizarro! In his kit and in his note-book would be found the means to reveal the splendour of the old American races. He would be the first to say to his fellow-Europeans, "See what we have destroyed, how great a people." Humboldt's loot would impoverish no one.

IV

In the summer of 1804 the young explorer returned home to find himself famous. It seemed as though every scientist in Europe was waiting for him, as though he had just discovered, for science, the New World.

"What is nature like in the New World?" was the question he must answer.

He sat down at once to unpack his bulky collection of specimens and to review his note-books. With

delight he spread before him his museum of wonders: lava-rocks, live birds, dried plants, charts of climate, facts about the electric fish. The secrets of nature filled his house, and as he busied himself sorting the piles, the rueful thought came to him, "How can I, one man with one lifetime, hope to understand all these mysteries?"

He must have help. Round him were famous scientists eager to share his wonder. Very well, he would let them; together they would study the works of nature. He flung open his doors. To the French chemists, Arago and Gay-Lussac, he said, "This pile is for you. Study it. It will enable you to tell us something about the chemical forms nature assumes in the New World."

To two biologists, Cuvier and Latreille, he said, "Gentlemen, here are my facts and specimens of animal life in the New World. See what you can discover that is new under the sun."

In all he invited nine scholars to help him. "And now, gentlemen, to work!" Ten minds co-operating, there began the study of nature in the New World.

But if Alexander von Humboldt thought to dispose of his five years of exploration in that way, he soon saw otherwise. One day the thought struck him, "These secrets of nature that we are unearthing, they are true not only in the New World but on the whole earth. My studies are about the whole cosmos," he thought, using a scientific word which means the world and the things in it. "I shall write a work, then, called *Cosmos*. To that task I give my life."

Nobody had ever soared higher in imagination. Nobody had ever set himself a higher goal, and all the world watched in admiration as Humboldt scaled

the Chimborazo of his mind. *Cosmos* became one of the greatest books ever written. Its pages deal with all things, from the tops of mountains to the underground. Into its volumes, Humboldt emptied the storehouse of his mind.

In his study he must have felt like a god sitting on a distant star, viewing the ball of the earth as it rolled through space. "There is its atmosphere," the god muses. "What is it made of? How does it act? . . . Now its surface of mountains and plains, deserts and seas, islands and continents. . . ."

One day a puzzle presented itself to Humboldt. "Here are two places, New York and London. London is farther north than New York. Yet it is warmer in winter. Here are two other places . . . they have the same latitude but different temperatures. Why?"

He began to plot new lines on his map of the world. When he finished, he had made a new kind of map, a map of temperatures. His lines ran zigzag over the world map. Just as each line of latitude runs through all places of like distance from the equator, so Humboldt's new lines ran through places having like temperatures.

"Isotherms" he called such lines, and to-day no student of Geography can do without the isothermic map first invented by Alexander von Humboldt.

His eye swept over the map again. He saw that while the parallels ran straight across, the isotherms wriggled and twisted and ran askew.

"Why do not all places on the same parallel have the same temperature? For that matter, why don't those places have the same climate altogether; the same amount of rain, of dry weather, of sunshine?"

Here was a puzzle indeed. He recalled his ascent of

Chimborazo; how the higher he climbed, the less hot and heavy the atmosphere was, until he had come to a land of winter.

"The height above sea-level counts in climate," he put down in his book.

He recalled, too, that when he had pushed through the jungles of the Orinoco, his boat had been frequently swamped in rain; but in the city of Mexico rain fell very moderately, and the desert was not far away. Casting about for an explanation, he found it on the map: Mexico City was situated on a high plateau and surrounded by chains of mountains. Before the rain clouds could reach the city, they had to sweep by those mountainous guards, and that was often impossible. On the other hand, the Orinoco basin was open to the sea winds from the northern coast.

"Mountains affect the rainfall," he put down.

Sea winds. . . . Winds. . . . How do they blow? . . . Where? . . . When? Night after night for year after year sat Humboldt pondering. "Thanks to the Gulf Stream, England, although as near to the Arctic Zone as is southern Labrador, keeps warm. What gives the Gulf Stream its heat? The tropical lands, of course. What would be the climate of Utah, if the Rockies were not there to stop rain clouds from the Pacific Ocean?"

The Science of Physical Geography was being born in Humboldt's study.

Now Humboldt asked himself another question, "How does climate affect life?" Again he recalled the change of scenery as he had scaled Chimborazo; how the jungle palms had been replaced by more and more hardy woods until he had come to a zone of shrubs and sparse grass; how even that, as he climbed, had turned into bare rock and snow.

"The Indians living in the jungles along the Orinoco," he thought, "why are they not as enterprising as the people here in western Europe?"

There was but one answer. The climate made the difference.

For decades Alexander von Humboldt worked to reveal the features of the earth, and to explain those



ALEXANDER VON HUMBOLDT WORKED TO REVEAL THE FEATURES OF THE EARTH

features. And as each volume of *Cosmos* came into the hands of scholars the world over, their admiration increased.

"Why," they exclaimed, "Humboldt has shown us a new way to look at ourselves and our earth."

Using the great geographer's way, they began to look about them. They were now able to see why

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their own cities, their own districts were what they were. They found themselves able to explain all sorts of places and people: the Eskimo and the Fiji Islander, the cowboy and the Indian, the Italian peasant, and the German mechanic; why each became as he was.

In a quiet street in Berlin lived a white-haired old man, the Baron von Humboldt, founder of the science of Physical Geography. Outside his door waited scholars and curiosity-seekers for a word with him. Kings sent their ambassadors to beg his presence in the palace. Learned societies sent him their highest honours. Governments asked and followed his advice on how to make studies of their countries. The human cosmos rang with homage to him.

All the time he sat in his study amid jungles of books, his table mountainous with maps, his pen flying sixteen hours a day.

"I have done so little," said he mournfully. He was then eighty-nine years old, and about to leave the world another date to commemorate—May 6, 1859, the date when he died leaving his own imperishable monument, the Science of Geography.

HENRY CRESWICKE RAWLINSON

A LOST WORLD

The human world is ever changing. Buildings are built and torn down; cities grow and are destroyed; civilizations rise and fall. There is a sort of explorer who digs into the past. He is called an archæologist. . . . Even as a schoolboy, Henry Creswicke Rawlinson liked to read the old geographers, like Herodotus and Ptolemy. "Can we ever find the ruins of the bustling towns Herodotus knew?" he wondered. "If ever I have an opportunity," he thought wistfully. Opportunity came.

A PERSON travelling in the East might find himself among the ruins of Persepolis, a flourishing city of two thousand years ago. He would wonder at the decorated tombs—no doubt the tombs of kings—and at the mouldering remains of a great palace, with only a few high columns still standing to remind him of its former glory. As he gazes at the silent ruins of the "Persian City," once the busy capital of the mightiest empire of the world, he might sigh, "Thus the glory of the world passes."

The walls and monuments, he would notice, are covered with curious wedge-shaped designs. "What are these? Decorations, perhaps."

A few travellers of one hundred and fifty years ago were very curious about these wedge-shaped decorations. They copied them in order to study them more carefully in Europe.

In Göttingen, Germany, Georg Grotefend, a teacher of Greek, was shown the peculiar wedge-shaped marks. His friends knew that no one was quicker at solving

puzzles than Grotefend. When he examined these marks, he noticed a strange thing. All the 'decorations' looked alike! What in the world were they? These must be letters in some language, long forgotten.

"But how can I learn this forgotten language, when I don't know a single letter? If I only had a clue . . ." He glanced over the strange characters. . . . "What's this?" he exclaimed. He could make out a single group of signs—no doubt a word. This word occurred again and again. "What word would a king use on monuments so often? Either his name—or the word 'king.' I have it! It must be 'king.'"

He continued his study. "Here's the same word again, but with another ending. That must be 'kings.' Here these two words are side by side. That must mean 'King of Kings'!"

The scholar could have danced for joy. He knew that the old Persian kings liked to boast of their greatness. He knew that each called himself 'King of Kings.' That was his clue.

The word, which he believed to be 'king,' he found in the first line, and with it another word. "This might mean 'great,'" he reasoned. The phrase would then read 'Great King.'

He looked at other copies of inscriptions. They all seemed to be worded in the same way, "Great King, King of Kings."

So far, so good. Again he took up the paper. What could he now discover? He peered at the paper. Nothing new. His face fell. Just as he was putting it aside, he thought, "Here is a king. He erects a monument, celebrating something or other—most likely a victory over his enemies. He calls himself 'Great King,

King of Kings.' What else would he write? What else?

"His name!"

With this new guess in mind, Grotefend lifted the paper. His hand trembled. The first word, which was unfamiliar, was followed by the familiar phrase. The first word might, therefore, be the king's name!

His eye travelled farther down. Again the phrase he knew. And before this, another unfamiliar word. "This might be another king's name. Suppose I call the king whose name is first on the paper, King X. Then the first line reads, 'X, Great King, King of Kings!' I am making progress. I'll soon be able to read a language dead for two thousand years."

He studied his wedge-shaped characters. "'X, Great King, King of Kings, . . . Y King.' The missing word must be—let's see—'son'?"

He read the words again, "'X, Great King, King of Kings, son of Y, King.' At this rate, I'll soon know the Old Persian language."

Farther on he read, "'Y, Great King, King of Kings, son of . . . King.'"

"I have it! I have it! This inscription contains the names of three Persian rulers—grandfather, father, and son. Now who are they? Let me look at my list of Persian kings. One, two . . . twelve. My task will be easy. There were only twelve Persian kings. And there's another fact I think I know. These three were grandfather, father, and son. That rules out a few of the twelve. . . . Hystaspes, Darius, Xerxes . . . How do these names correspond with the Persian text? The first is longer—as it should be."

II

In 1827, Henry Rawlinson, a boy of seventeen, had gone out to India in the service of the East India Company. All he knew of the strange wedge-shaped characters of Persia was that they were a hopeless puzzle. He had never heard of Grotefend and his work.

Since he learned languages very easily, he was soon able to understand several of the languages spoken in India. He spoke the modern Persian language almost as well as a native. Unlike his comrades in the service, Rawlinson found time to do a great deal of reading, especially in history. At one time he was arrested because of his love for books. He had bought more books than he could pay for; he owed the book-seller nearly twenty pounds.

Rawlinson's curiosity was aroused by the ruins of the ancient world round him. He journeyed to Persia, where he came to a remarkable rock, five hundred feet high, at Behistun. On the steep face of this rock was hewn, three hundred feet up, an inscription which Rawlinson was eager to study. But there seemed to be no way to climb the rock, which was bare and slippery. It seemed as if he would need more than his tall, athletic frame to climb it. The foot ledge was about eighteen inches or, at most, two feet in breadth. One false step would have hurled him down the precipice. But he possessed a keen eye, a cool head, and a sure foot.

Three and four times a day, for many a day Rawlinson climbed the three hundred feet without the aid of rope or ladder—without any help at all. On reaching the ledge, he steadied his body against the rock

with his left arm. In his left hand he held a note-book, his right hand was busy with the pencil. At the risk of his life he copied the inscription of about four hundred lines.

Now he set to work on the mystery of the wedge-shaped signs. His eager eyes saw a word occurring again and again. This inscription, he reasoned, was engraved by order of some king. It must therefore be the Persian word for 'king.'

The method that Grotefend used, Rawlinson used also, "Here's the same word again, but with an ending. The words are side by side. The phrase must mean 'King of Kings.'"

The same list of kings that Grotefend puzzled out occurred here. And Rawlinson, with no knowledge of that pioneer's work, hit upon the same list of kings. "Hystaspes, Darius, Xerxes . . . How do these names fit? The first name is longer than the others—as it should be."

At this point Grotefend had stopped. Rawlinson, however, was just beginning. By dint of great perseverance, he worked out for himself the entire alphabet of the Old Persian language.

He discovered that the inscription had been placed on the rock by Darius, King of Persia, who wanted the world to marvel at his mighty deeds. The rock stands on the great highway between Persia and Babylonia, and can be seen for many miles. In the inscription, the King recounts how he defeated numerous rebels, and conquered many nations. Above the inscription is engraved the picture of King Darius, who stands with his right hand saluting the god Ahura-Mazda, his left hand resting on one end of a bow, and his foot trampling an enemy.

When Rawlinson sent a translation to the Royal Asiatic Society of London, great enthusiasm arose in Europe. Learned societies honoured him. Everybody agreed that, although his work had been carried out under greater difficulties than that of any other European scholar, yet he had surpassed them all.

Studying the inscription further, Rawlinson could make out what seemed to be two other systems of writing besides the Old Persian that he could read. "There must be three languages here. King Darius probably wanted all the nations of his great empire to understand what is written on this stone." Having deciphered and translated the Old Persian, he now set himself to the task of working out the other two languages. As a result two more languages, the Babylonian language and that of the land of Elam, are known to us.

Inspired by his great work, scholars were now able to read the curious wedge-shaped writing, which they called 'cuneiform' writing. To this task they applied themselves, and by 1853 archæologists had uncovered in Persia and Babylonia the remains of a vast civilization, undreamed of before.

Many people still doubted. "You say that you can read the cuneiform writing," they said. "But if we were to give the same writing to different scholars, each one would translate it differently."

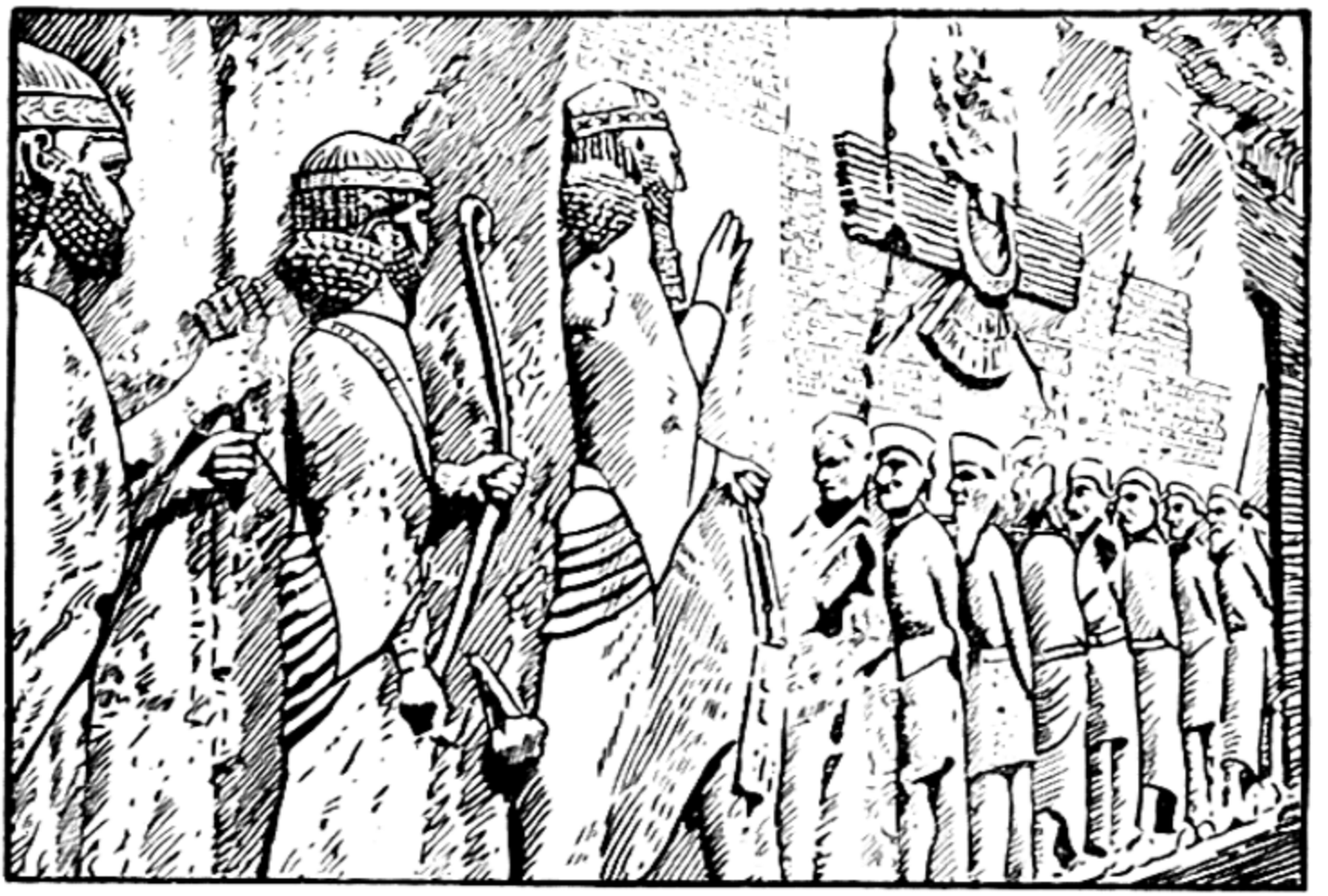
"Test us," calmly suggested Rawlinson.

From the ruins of a temple was dug up a clay cylinder. Four different scholars were given copies of it. "Translate it," was the order.

The result was the glory of Rawlinson's work. All four, none knowing the version of the other three scholars, gave the same translation, which turned out

to be the story of a king who ruled long before David was King of Israel.

The doubting world was now convinced, and Rawlinson kept on with his work. It was not easy. The clay tablets were often found shattered in a hundred particles, and it was harder than any jig-saw puzzle to



KING DARIUS RECOUNTS HOW HE DEFEATED NUMEROUS REBELS, AND CONQUERED MANY NATIONS

fit the tiny fragments together again correctly. Then, the writing was small and so worn down that even a magnifying glass would fail at time to bring out an uncertain letter. After the shattered particles of clay were set into their original form, and the cuneiform letters made out, came the most difficult task of all: to decipher the new words.

Rawlinson set for himself two great projects. He

would translate these ancient documents so that the world could read them, and he would lead an expedition to the East to uncover other ruins of the past. The British Museum in London became his workshop.

There Rawlinson, who was now acknowledged as the leading authority on cuneiform writing, pored over the faint inscriptions of three thousand years ago. Since the time he had shown the world the meaning of the wedge-shaped symbols, archæologists had dug up a mass of baked-clay cylinders and tablets, boundary stones, bricks—all with cuneiform writing on them. From the ruins of Babylon, Nineveh, and other ancient cities, these were shipped to the British Museum for Rawlinson to decipher.

When these constant reminders from Bagdad and from Persia had made him long for the East he loved, and for his Persian and Arab friends, he left London to lead an expedition into the past.

He showed himself to be an expert archæologist. He knew just where to excavate for relics of ancient times. What could be more exciting than digging up a statue, a glass, a piece of ivory thousands of years old? On lucky days the archæologist struck the temple of an ancient god or the treasures of a king; on bad days nothing.

Once Rawlinson was examining a large heap of clay tablets. "It seems I have discovered an Assyrian library," he exclaimed. The more he read the ancient writing, the more amazed he was. "Here is an Assyrian grammar, and here a book on science. What is this? Something we have been hoping to find, a table of Assyrian weights and measures! Now we shall understand their systems of measure. And here are all the other books that should be in a library—books

on history, geography, and astronomy." With what care he packed the fragile clay books to be shipped to the British Museum!

Every moment he could spare from his duties and from his working on the cuneiform mystery of the Behistun Rock, was devoted to the geography of the region where he was stationed.

"I am not ready to be a geographer," he said, "until I have studied all the accounts of the lands I shall explore." It did not matter to him whether the geography was written in Greek, Latin, Arabic, or Persian, for he knew them all perfectly. And, because a geographer must know how to make maps, he learned how to use astronomical instruments.

What interested him most were the obscure and rarely visited ruins of Persia. He wondered what ancient towns were once there. "Was it a living town in Roman times?" he would ask himself. "What did the Roman writers say about it? What trade routes led through it? What was the town's name then? Perhaps some Persian traveller wrote about this region. I shall find out by looking through Persian manuscripts."

Rawlinson's keen eye saw through the ruins to the old-time stirring town, and his knowledge of the ancient geography of the country enriched the world's knowledge of the East. He became not only the foremost scholar on cuneiform writing, but also England's authority on Central Asia. Therefore the Royal Geographical Society elected him president. Whether it was the question of what is the best route for an overland telegraph from Constantinople to Karachi, or what trade routes lie between Turkestan and India, Rawlinson knew the answer. For he had linked his geography of the present to his dream of the past.

III

Let us wander through the Babylon that Rawlinson conjured up for us, in the days of Nebuchadrezzar when Babylon was in its glory.

As we approach the city with its million inhabitants, we cross the deep moat surrounding the city, the moat flooded from the river Euphrates. The city is surrounded by a brilliantly coloured wall, more than three hundred feet high and so wide that a four-horse chariot can be drawn along its top. The city is mighty, and its walls extend perhaps fifty miles round.

We choose the gigantic Ishtar gate to enter by, though there are a hundred such gates all delicately engraved in bronze. As we pass through the gateway, the King's guards from the six square towers salute us. The walls of these towers are covered with glazed tile, decorated with a pattern of horned dragons and unicorns. The Ishtar gate leads us to Procession Avenue, which stretches as far as the eye can see straight through the city. It is the Broadway of Babylon, beautifully paved and bright with the glitter of enamelled bulls and lions, the ornamental figures set on the walls lining the way. It is the strolling ground for the "smart folk" of Babylon. To the great King Nebuchadrezzar's palace we go, there where Daniel lived and Belshazzar feasted. Its interior, say the Babylonians, is brilliant like the dome of heaven, and its walls decorated like to the splendour of the rising stars.

For Babylon is the mistress of the world. The fleets of Phœnicia sail at its bidding. To Babylon are sent gold and iron from Africa and Spain. The King's mariners, sailing from the Euphrates, bring from India and Ceylon gems, pearls, spices, precious woods.

The fleet camels of Arabia bear their precious burdens to this world city.

Fifty broad avenues cross one another, dividing the city into a chess-board of gigantic squares. That is a convenient way to lay out a city; it is easy to find one's way about. Our friend, Nebo, for instance, lives so many blocks north and so many west of the Ishtar gate.

We have wandered to the east side, and we must cross the river Euphrates which flows through the city. Shall we walk over the bridge, or be ferried across in a circular boat, like a tub made of leather? The east side of Babylon is the business quarter and the factory district of the city. There women have their beauty shops, and men earn their living as carpenters, cabinet-makers, perfumers, jewellers, metal-workers, and stone-carvers. From beyond the city walls the farmers come here to market their produce.

One thing we as moderns must admire. The houses are well built, and the water supply and drainage system are excellent. Nebuchadrezzar is proud of this. His hobby is the Bureau of Public Works.

> My father and I both [he claims], believe that our welfare lies in good streets and first-rate buildings.

Babylon is the home of big business. Over in Procession Avenue there is a great clothing factory employing almost two hundred women weavers. Fur, linen, and wool are all used. But for an amazing scene we visit the great temple next to the palace. We seem to be in a modern city hall with all its administrative offices. Here is the tax-office, the bureau of weights and measures, and the property, recording, and contract departments. Babylon is as well organized as a twentieth-century city.

King Hammurabi, the Great Lawgiver, is responsible for this. "Justice means," thought Hammurabi, "that the weak and poor are protected against the rich and powerful." So he established laws for wages and rent, for making business men responsible for their contracts, for helping the farmer. Among the great lawgivers of the world, Hammurabi the Babylonian stands high.

Yonder is a fellow, clad in the tunic and sandals of the day, who is strangely busy. He seems to be chiselling something. In one hand he holds a slab of damp clay, like a biscuit; in the other, a stylus, which he wields like a pencil. His strokes with the stylus leave signs in the clay like a wedge or a nail. The fellow must be a scribe. He is indeed inscribing a letter.

The scribe is an important personage in Babylon, the most highly educated man there. He has been to school; he has learned reading, writing, arithmetic, and grammar. Any Babylonian who wishes to communicate with a friend, say in Nineveh or Sumer, must ask the scribe to write for him. The letter is a lump of clay, and its envelope a basket.

> The king has commanded me [says the scribe proudly], to transcribe one of our great poems on the rock outside the city.

He recites part of the poem for us:

> When the young dawn gleamed forth,
> From the foundations of heaven a black
> cloud arose . . .

We go on. Everywhere in Babylon we see wonders. Within its city walls are enormous temples with bronze doors, courts of justice, royal libraries lined with clay

books, an astronomical observatory, and the famed hanging gardens. But whether in Babylon, or Nineveh, or Persepolis—everywhere we see noble cities in which scholars are studying history, medicine, and astronomy.

IV

Our knowledge of this long-forgotten world we owe to Henry Creswicke Rawlinson and men like him who explored not only foreign lands, but past ages. For every bygone age leaves its tracks in the dust of time where those who explore ancient life—the archæologists—read the story of the ages. Their work is somewhat like rummaging in the attic for clues of grandfather's past life.

To an archæologist a piece of clay, a splinter of wood, or a trinket may be eloquent.

> Rheumatism [said the archæologists once], was a common disease in early Egypt. We have dug up mummies which we know date back to the time of the early Pharaohs. Their joints are twisted and swollen to a degree that must have been painful—sure signs of rheumatism. The Nile was constantly overflowing its banks, and the Egyptians lived therefore in a marsh. Later mummies have normal joints, because later Pharaohs erected dams to keep the river in check.

Our understanding of ancient history depends on men like Rawlinson. For instance, some scholars used to scoff at the legend of Troy. "Troy never existed," they said. "It was only imagined by Homer."

Heinrich Schliemann, a little German boy, was very much troubled by this disbelief. He liked Homer. He liked to read about Troy when Helen was the reigning beauty and Hector the best fighter. Heinrich was sure

that these people really existed. "Some day," he vowed, "I shall prove it."

So when he grew up, he went to the Dardanelles where he thought Troy once stood. There he began to dig for the ancient capital of King Priam. Bit by bit the walls of a fortified town began to be disclosed, and within a short time three great gates were uncovered. The roadway of the largest of these passed through a huge tower. To Schliemann it seemed that this was "the great tower of Ilios" guarding the Skaian Gates, where Helen anxiously watched the duel between Menelaus and Paris. But Schliemann had done far more than find Homer's Troy. He had revealed a Troy far older than the Homeric one. For the ruins of nine cities are piled one on top of the other. One of them was Homer's Troy.

Schliemann, as well as Homer, gave us Troy. And now that we have seen the glory of Babylon, shall we not say that Henry Rawlinson is one of those who made it ours?

ROY CHAPMAN ANDREWS

IN THE BEGINNING

Explorers like Rawlinson map the past for a few thousand years. There are other explorers, however, who show us the time when the ocean rolled over our highest mountains; when glaciers covered the African jungles and palm-trees grew in Greenland; when dinosaurs roamed the earth. Dinosaurs vanished millions of years ago. Yet we find their skeletons in our museums. Explorers like Roy Chapman Andrews brought them there. How did he get them? Watch him work.

IN the summer time of the early 1920's a troop of about fifteen men and three motor-cars climbed north-west out of Peking, and crossed into Mongolia. The grass of the plains grew shorter and the sage-brush appeared. As he swept the horizon with his glass, the leader now and then detected the hump of a camel notching the sky, and a caravan winding slowly past. Past cool hills, past dewy woods, chugged the motors, into the sand wastes and brilliant colours of the Gobi Desert.

The native Mongol squatting outside his yurt or reining his horse beside a desert well, must have looked curiously at the band of white men. Who were they? What did they want here? Their appearance told him nothing. They were clad in khaki, and wore cartridge-belts and revolvers. Their behaviour puzzled him even more. They seemed to be going nowhere. Any caravan from Kalgan, despite the slow pace of its camels, could have beaten this motorcade to Urga. Sometimes the white men encamped in the shadows of a long ridge of hills, or on the open steppes, or on Gobi's

sands. For days their tents stood erect, steeped in the changing hues of the sunset or the glare of noon.

For all the evils of a desert wind-storm or the prowling bands of brigands, the white men seemed unconcerned. On a morning, a few of them would pile into a car and, armed with gun and camera, go chasing the tawny antelope that streaked across the plain. No beast was safe from the puff of their rifles, no slope too steep, no rocks too jagged for them. They were hunters perhaps. But others of them would ride off with pick and shovel, scanning the earth and the cliffs and the sands. Suddenly these would halt and proceed to dig. For what?

"It is not to be believed that they are just hunters," the Mongol might have said to his friend, squatting outside their yurt or on the way home from the monastery. "But it is true, nevertheless, that they are digging for old bones. For days they lie prostrate under the sun, clearing the sand away with their bare hands, grain for grain, so as not to hurt the dry, old buried bones. The skull of some ancient beast is enough to inspire them with ecstasy. Their caravan is freighted with rocks and plants and skins and many old bones. Surely they are mad."

To the Mongols the band of white men in the Gobi Desert seemed mad. Only a civilized person could understand. They were the field-workers of the American Museum of Natural History. Two were geologists; that explained their interest in rocks and soil. Two were zoologists; that explained their interest in the animal life. Five were palæontologists; that explained their interest in buried bones. There were three topographers, who made charts of the regions over which the expedition passed; and there was an

archæologist who hoped to find clues to the ancient life of Mongolia. The main purpose of the band was to explore the past. In Mongolia, they hoped, they could find out what creatures lived in the very distant past.

In the silences of a Mongolian night, when the wolves crept out of the hills, the talk round the camp fire was of the day's work. One of the men might show a fragment of shale he had found which had the imprint—the fossil—of a mosquito. The mosquito, reckoned the scientist, had lived more than one hundred million years ago. Another might show the fossil of a butterfly's wing. The fossils were passed round.

One night, on the way to the southern edge of the Gobi, the geologists reported that they were travelling over favourable ground for fossil hunting.

> The rocks here [they said], are sedimentary. That means that once, before it was pressed into rock, the soil was sandy. In that far-away time, the sands may have buried the skeleton of a primeval animal. If so, you will find the skeleton, a stone fossil by now, in those rocks.

The geologists had done their share. Now it was the turn of the palæontologists, and with their picks and shovels they were on the trail the next day.

None of them thought of the dangers of the wild Gobi. They had been attacked by brigands; had almost driven over a cliff; had been wrecked by desert storms. Yet nothing could shake their confidence in the success of the expedition, for that confidence had its source in their leader. Back in New York, the officers of the American Museum of Natural History and the men who were spending one hundred

and thirty thousand pounds on the expedition, were also confident of its success, for they had picked its leader. Who was it that created all this confidence?

His name was Roy Chapman Andrews. He had come to the museum in 1906 when he was a young man of twenty-two. Did the director need anyone to scrub floors, he had asked? The graduate of Beloit College in Wisconsin was not anxious to scrub floors, but if that was the only way he could work in a museum, he was willing. He had spent the best days of his boyhood in the woods of Wisconsin with his gun, camera, and note-book. He had stuffed and mounted game. He had been entirely happy when on the river or in the woods, for he was a born naturalist. That was why he had come to the American Museum of Natural History in New York.

He did not scrub floors long. One day he was detailed to help build a model of a whale. At once he dropped his mop and rushed to the library, where he read everything he could find on the subject of whales. The director of the museum, watching him work on the whale, hired another floor-scrubber. And when Andrews boldly asked to be sent to Alaska to study live whales for the museum, the director gave his permission.

Roy Chapman Andrews had realized the ambition of his boyhood. Or rather, as he packed his gun, camera, and note-book, he stood on the verge of realizing his ambition. For first he must prove to the director that he would make a competent field-worker for the museum. He proved just that. He became so reliable a naturalist that the United States Bureau of Fisheries invited him to study seal life in the Pribilof Islands of the Bering Sea. That led to increased respect

for Roy Chapman Andrews in the director's office of the museum.

"Would you like to go to Borneo and the Dutch East Indies?" the director asked Andrews one day.

"Do ducks like to swim?" murmured the young man.

"He likes to go where no one else does," people said of Andrews. For him the ends of the earth were just round the corner.

To the East Indian islands that Magellan's men had once added to the map went the young naturalist. But not as the old explorers had done. The pythons that coiled in the jungles had never been troubled by the presence of explorers. But one morning, a hungry python, twisted many times round a tree trunk, saw out of the glittering beads in his dark flat head a feast, in the form of a young naturalist. The python reared its twenty feet of crushing coils. Andrews raised his gun; another stuffed python was added to the museum collection. . . . The volcano on the island of Ternate had never been climbed by the old explorers. Here was a different explorer. Up the cone of the volcano, to peer down into the crater which churned and hissed, went the naturalist from the American Museum of Natural History. He jotted a few remarks in his note-book, and climbed down.

Frequently Andrews was reported killed; and who could disbelieve the reports, considering the risks he ran? He always turned up promptly in New York, however, and always with plans for another hazardous expedition. He was appointed the Curator of Mammals in the museum, but he hated life indoors and always yearned for the wilds at the ends of the earth where he could 'collect.'

SRI PRATAP COLLEGE LIBRARY
SRINAGAR

In the spring of 1920, he returned to New York from the frontiers of Tibet. His cases were filled with the largest collection of mammals ever taken from a single region of Asia. The president of the museum was delighted. But the mind of Roy Chapman Andrews was full of the sweeping horizons of Mongolia and the most ambitious plan ever laid before Henry Fairfield Osborn, the president of the museum. Twenty years previously, President Osborn had announced to the scientific world his belief that the creatures of the earth had begun life in Central Asia. It was only a theory; he could not prove it.

"Let us test your theory," now urged Roy Chapman Andrews. "Let us explore Central Asia—Mongolia, the Gobi Desert—for traces of primeval life. Maybe we can discover the past history of the earth, buried there."

The scale of Andrews' thought staggered President Osborn. "It will cost a quarter of a million dollars," he exclaimed. "It will take years of work. And it may be a dead loss."

"It's a gamble," admitted Andrews. "But think what we stand to gain," he continued excitedly. "We will attack the problem from all sides. Our expedition must have all sorts of scientific experts—a zoologist, a palæontologist, a geologist, an archæologist, and others."

In the olden days, an explorer like Columbus asked for a little money to find a land that one could see and profit by. This new explorer proposed to find knowledge of a world buried millions of years ago. The old explorer asked for brawny men who could climb the rigging of his vessel and pull an oar. Andrews asked for scientists. The old explorer went in search

of gold; the new explorer in search of rocks and skins and fossils.

"He will find no fossils in the Gobi Desert," said some scientists. "He will be unable to use motor-cars in the sandy wastes. The expedition will be a failure."

But the officers of the museum had faith in Andrews. The scientists who formed his expedition had faith in him. And so they found themselves with him in the Gobi Desert, exploring for a world of life dead æons ago.

"The rocks here," reported the geologists, "are sedimentary. They may contain fossils. Here we must dig."

II

Rooting in the sand, the palæontologist saw something embedded in a rock. The rock was formed millions of years ago—maybe ten millions—and had once been buried under layers of other rock and sand. But wind and weather had worn down those top layers, until the landscape round the band of workers was gashed with ravines and gullies, and the old rock was as bare as it was millions of years ago.

The palæontologist straightened up. He held out the fossil of a large bone, and his companions flocked round him.

"Reptile," he said laconically. "Dinosaur."

"Dinosaur" means "extinct reptile," so Andrews' heart leaped. "Then life did once exist in this desert!" he could hope. In the gamble for the truth he sought, Andrews' chances soared. That night the song of the camp-fire loaded the desert air with joy.

The prospectors of old bones worked feverishly, for

they had struck a "fossil Klondike." Bones, tons of them, came out of the earth. It seemed as though all the monstrous dinosaurs had perished here. Andrews gloated. "You'll find no fossils in Mongolia," the pessimists had predicted. No fossils! He had shown the way to the richest fossil area in the world, an area that once had teemed with life.

Now dinosaurs never could exist in a desert. And judging by the teeth of these fossils, many of them were vegetable feeders. About ten million years ago, therefore, trees had shaded the primeval creatures of Mongolia. The dinosaurs had wallowed in the mild lakes and streams there. In this paradise had lived these giant reptiles, some of them sixty feet long.

One day, under the skilful scraping of the scientists, some curious objects came to light among the bones. At first the men were puzzled. The fossils looked like eggs. Could they be bird's eggs among the dinosaur bones?

"Nonsense," said the geologists. These eggs were enormous, measuring from four to nine inches in length and seven inches round. Also, a bird's egg is larger at one end to keep it from rolling out of the nest. These eggs were like fat sausages.

The men looked at one another. There was but one explanation—dinosaur eggs. "Of course!" cried Andrews. "Dinosaurs were reptiles, and most reptiles give birth to their kind by means of eggs. This is a great discovery."

At once every one was on his hands and knees grovelling for eggs one hundred million years old. Dozens of them turned up, lying in the same bed with the skeletons of newly hatched dinosaurs.

"Why did mother dinosaur lay her eggs just here?"

wondered Andrews. "And why is it that so many of them didn't hatch?"

The answer came to him: "One morning, ten million years ago, a monster waddled to this spot. Here in the red sand it squatted, laid its eggs, and departed leaving them to hatch in the sun. And so they would



IN THE DAYS OF DINOSAURS

have done but for a storm which piled the eggs with enough sand to crack them, and bury them."

Like detectives piecing together the facts of a crime, Andrews and his men pieced together from fossil clues the primordial history of Central Asia and the fate of its creatures. "Now," the question was, "what or who put an end to the cold-blooded reptile?" No one knows.

At supper-time one day, when Andrews had his

headquarters at Tsagan Nor—which is Mongolian for the "White Lake"—situated north-east of the Altai Mountains, two of the men rushed in with shining eyes. They had discovered the skull of a baluchithere. 'Baluchithere' means the wild beast of Baluchistan, where the remains of the creature had first been found ten years previously.

"What a monster!" exclaimed the men gazing at the five-foot skull. When, presently, they uncovered other parts of the olden beast, they could estimate that it stood eighteen feet from hoofs to tusks, and that it resembled a sort of giant rhinoceros. Judging by its teeth, it must have lived on the foliage of trees.

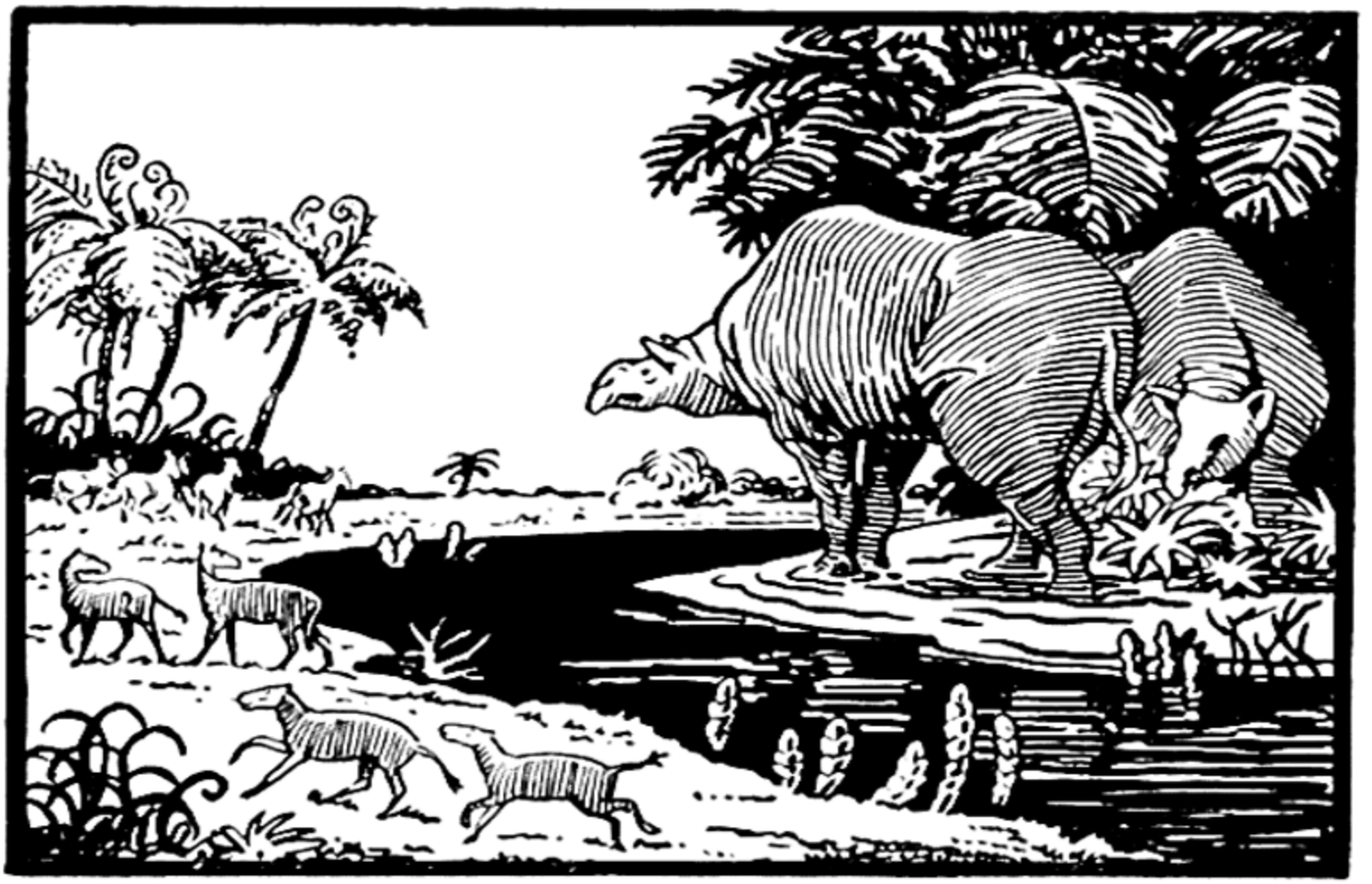
Everybody was now hunting for baluchitheres. One day, one of the men dug out an upright fossil, like the trunk of a tree. He summoned the palæontologist. "That," said the palæontologist, "is the leg of a baluchithere. But why is it upright? Fossils are usually found horizontal." He consulted the geologist. "Ah," he ventured, "this was once a quicksand. The poor beast was caught in it. You will find the other three legs standing where they ought to be. The rest of the skeleton has weathered away."

Sherlock Holmes would have respected these scientists. On the rock three spots were marked out as far from the upright fossil as the three legs might have been. At these spots the men dug, and found three more upright trunk-like fossils.

The baluchithere thrilled Andrews, not only because it had lived after the cold-blooded dinosaur, but because it had been, like man, a warm-blooded animal, a mammal. All mammals give birth not to eggs, but to living creatures, whom they nurse with milk. Finding

the baluchithere, therefore, meant to Andrews that he might be somewhere near the trail of ancient man.

Meanwhile he was packing his fossils and shipping them all back to the American Museum of Natural History in New York, where other scientists studied them. Those fossils told exciting stories in a language



THE BALUCHITHERE THRILLED ANDREWS

learned men understand, stories of the earth and its creatures. For the earth is changing every instant. The rain sweeps away a few grains of soil here and carries it there; the frost cracks a rock; the river gouges a lump out of one bank, and drops it on another. Deep underground, the rocks heave and sink and quake the earth, and lava boils. One lava island suddenly appears in the Pacific, another vanishes. Once the Alleghenies were an ocean bed—the sea-shells

in their rocks prove it. Once palm-trees grew in Greenland. Once glaciers floated in Africa. Probing into the attics of Time, scientists like Roy Chapman Andrews find the clues for such statements.

They raise up scenes, like nightmares, of the time when the family of the 'Terrible Lizard'—a dinosaur—trod the earth. In length the dinosaurs ranged from four to sixty feet. They wallowed in the water like crocodiles. Armoured like battleships they lumbered among the palm-trees. They snouted in the grass; or, if they had tusks, browsed among the trees. Some had horns and fought by rearing on their hind legs. One branch of the family had wings, and sailed the air like horrid bats.

The Terrible Lizard is not the only creature that the hand of Time has erased. Scientists conjure up ghosts of ancient sea denizens, splashing in the waters of long ago. There was once, for instance, a monstrous kind of lobster. He dwelt in a sea garden surrounded by jewelled coral and starfish. He used to draw the bead of his four eyes on shrimps crawling among the lilies. His gigantic claws would shoot out . . . and a few more empty shells would sink to the bottom. But the hand of Time reached forth, and the monstrous lobster, his entire family, sank out of existence.

Not all pictures of the explorer's deep past are so awe-inspiring. There is one of a handsome creature, no bigger than a small dog and just as agile. He had five toes on each leg, but except for that, was a perfect miniature of a horse.

These are the tales of those who map the past. Some travellers risk their lives to report the unknown space of earth. Roy Chapman Andrews and his type devote their lives to exploring the earth in distant

time. They track the footprints in Time's sands. Their purpose is to unroll for us the entire map of Time on earth. That is why Roy Chapman Andrews led his men into the Gobi Desert, once the lair of the Terrible Lizard.

WILLIAM BEEBE

IN THE DEPTHS OF THE OCEAN

Four-fifths of the earth is under water. It is, therefore, a great field for the explorers. Unhappily, it lies two, three, sometimes six miles below the surface of the water. Take, for instance, the explorer who wants to map the land of fish. What can he do? Lieutenant Maury of the United States Navy was the father of Oceanography, that is, the description of the sea. William Beebe of the New York Zoological Park to-day dives a half mile down and looks round him in a new world.

LEANING upon the taffrail of his ship about a hundred years ago, Lieutenant Maury of the United States Navy thought of the time when man first stood on the shores of a sea, confronted by the mystery of an unresting and endless tide. Man saw the sea heave and explode in high rage, he heard its threatening roar, and he shrank from its long fingers. In calmer moods, its playful sparkle attracted him. He dipped into its cool edges and floated on its back. The spirits of the deep could be kind, and sometimes let him thrash about like a child in the arms of its father. For the sea, like the sky, was ruled by friendly as well as unfriendly gods. It was treacherous, too, baiting him with siren forms and music. Man saw that he could live with the sea as with the sky, only if he learned to know all its ways.

Lieutenant Matthew Fontaine Maury continued his reflections. . . . Clinging to a log, man in early times found it easier to stay afloat. If he hollowed out the log, however, or joined it fast to another log and then steered with a branch, he could ride. Bigger

grew his craft, farther from shore his ride. Cunningly he fashioned lines and nets and spears, and the creatures of the deep fell prey to him. In search of his prey, he ventured out of sight of his shores and discovered new ones. Through the ages he cleaved ever more pathways on the seas, until, at last, looking at his navies, he could boast, "I know the ways of the sea."

"And yet," Maury wondered, "what do we know of the seas? We know how to sail upon them. Here a man knows one track on the water; there a man knows another. But can they say how cold or warm it is? How deep it is? Exactly how much salt it contains? What winds blow over it? Where its current flows into another? Not until we possess all that information about all the seas on the globe, not until then will we have a science of the sea."

The more he thought of it, the more was Lieutenant Maury convinced of the need of gathering this knowledge of all the seas. Some one ought to do it, he insisted; some scientist should devote himself to a science of the seas. But who? And one day the answer came to him, like a finger pointing: "You, Matthew Fontaine Maury, are the one who ought to do it."

His ship, the *Vincennes*, was sailing round the world. For years he was to be on the high seas, and many a lazy hour would be his to loll on deck with a book, or to watch the waters cream against the hull of the ship. A sudden enthusiasm seized the young officer; he would do neither of these things; he would spend his spare time writing a book on *The Physical Geography of the Sea.* He would be the pioneer in making the Science of the Sea.

It seemed an impossible task. How could he, one sailor, study all the waters of the globe? Even if he could sail through them all, he must have ten lives to stop long enough in all of them to find out their depths, temperatures, currents, winds, and more besides.

Back from his cruise, Maury hit on a plan. He prepared blank log-books, thousands of them, and gave one to every ship's captain he could reach. In this log-book the captain was to enter the names and location of all the waters he sailed, and all the facts about them that Maury needed for his *Physical Geography of the Sea.*

Glancing through the blank log-book, more than one hard-bitten sailor snorted, "Temperature of Water! What's he want that for? And Salinity! Who cares about that?"

Nevertheless, Maury got what he wanted. In nine years' time he had two hundred log-books, each reporting twenty-five hundred days of sailing—the equal of fourteen hundred years of observation! Now, with these facts before him, he was able to write his geography of the sea.

When his book was published, he was greeted with a burst of admiration from all corners of the world. Sea-faring folk were astounded by the book.

"Maury has shown us," exclaimed the admirals of Europe, "how to take advantage of the most favourable winds and currents. He has shortened our sailing routes."

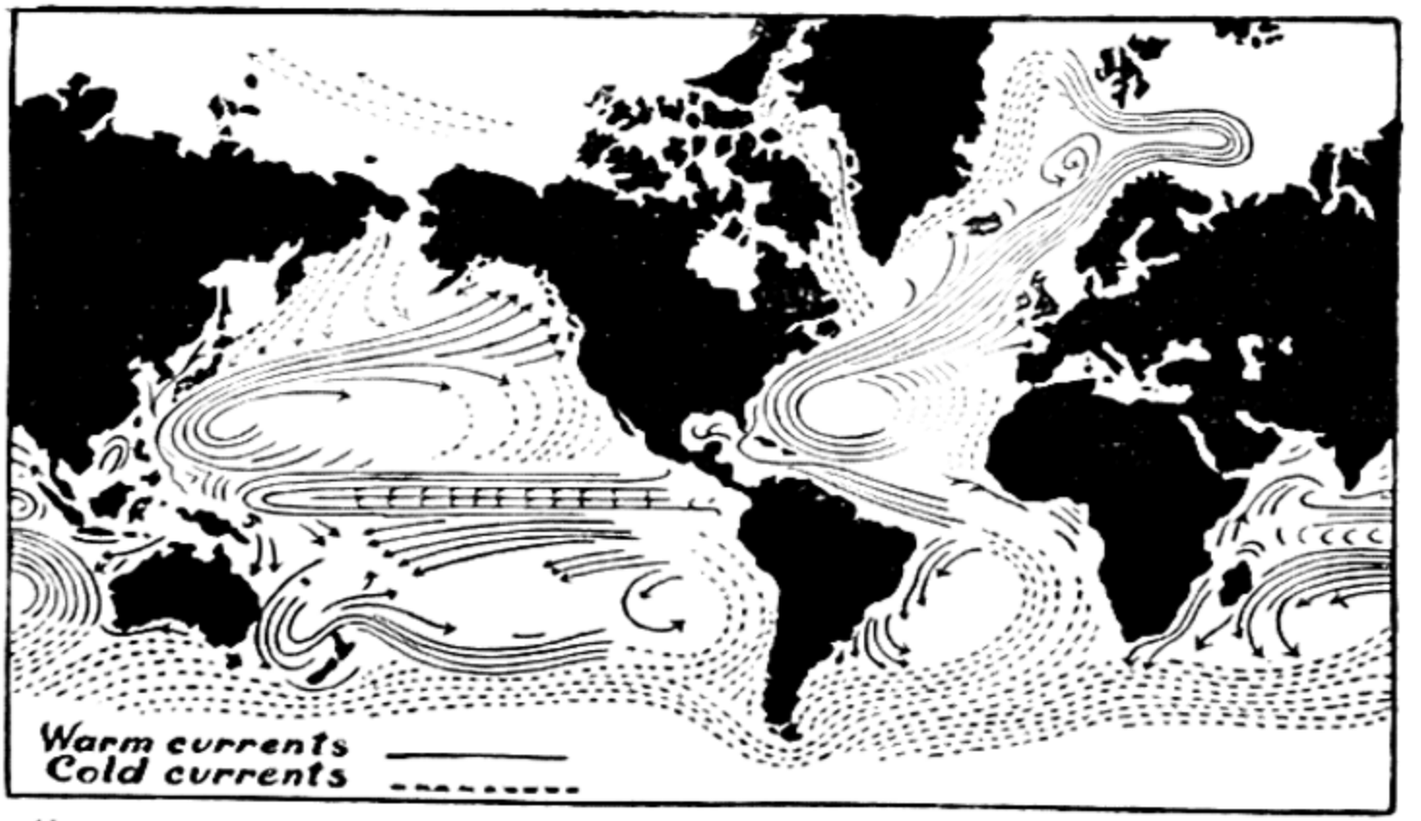
"We will ask our captains," decided the Governments of England, Germany, and Sweden, "to keep the same log-books that Maury has designed."

"And then," proposed Admiral Maury—for this

was his rank at the time—"all the nations might from time to time pool all their discoveries about the sea, and discuss them."

He was heard with respect. At Brussels in 1853, the first International Conference met to discuss the geography of the sea.

The Royal Society of England had another idea.



"MAURY HAS SHOWN US HOW TO TAKE ADVANTAGE OF THE MOST FAVOURABLE WINDS AND CURRENTS"

"Let us push Maury's work one step further," they suggested. "We might explore below the surface of the sea." The earth is almost four-fifths under water. Far below the waves is a realm of creatures and a surface of which the human race knows very little, reminded the Royal Society.

In the winter of 1872 the British cruiser *Challenger* left England. It carried aboard a staff of scientists and a laboratory. It was equipped with dredges and trawls and machinery to lower them deep into

the sea. The floor of the ocean, the scientists of the *Challenger* discovered, was in most places from two to three miles down. No human being could descend so far and live. Therefore, it was necessary to sweep up with dredges or trawls samples of the ocean in different regions. The scientists on board sorted the samples, preserved them, and studied them. The quest of the *Challenger* was 'oceanography,' as the geography of the sea is called.

Four years later the *Challenger* returned with a cargo of wonders. Imprisoned in bottles were the strangest assortments of seafolk ever beheld. Many of them were dead, unable to live except at a certain depth in the sea. Most of them, agreed the scientists, looked different and behaved differently in their own homes.

"If only," they wished, "we could ourselves go deep into the sea and study the scene with our eyes on it. To dip our instruments into the sea reveals to us many wonders. But not until we can send down a pair of human eyes and hands will the real marvels of the deep be brought to light. That will be the next step in the oceanography begun by Matthew Fontaine Maury."

II

It is late in April, 1925. The yacht *Arcturus* is lying in Pacific waters off the Galapagos Islands. Beside the Stars and Stripes, the *Arcturus* flaunts the pennant of the New York Zoological Society. Its mission is to study the strip of water named after Alexander von Humboldt, the Humboldt Current, which sweeps cold and wide up the western length of South America. What fish have their home in it? How deep is it? When the *Arcturus* steams back to New York, it will

carry the answers to these and other questions. The director of the expedition, William Beebe, and his staff of scientists are fishing out the answers.

The director orders a sounding, and at once the deck engine begins to grind. Rigged to the bows is the sounding machine it drives. A hollow tube, hung on a strand of piano wire, is being lowered into the sea. Attached to the wire also is a heavy iron-ball weight to pull the tube to the bottom. They disappear below the surface. As the wire unreels, the director reads off, fathom by fathom, the depth to which the tube has sunk. At last the machine signals that the weight has touched bottom and detached itself from the wire. Every time a sounding is taken, the iron ball is left at the bottom of the sea, for it is easier to draw up the tube without its weight. The wire reels back on its drum, a mile of it, two miles. . . . In a few minutes the tube appears. Inside it is a sample of the ocean floor which it has sucked up. Quickly Director Beebe takes it to his laboratory, empties it into a dish, gets out his microscope to peer at the ooze. What strange forms of life will crawl out?

Meanwhile on a platform astride the bow of the *Arcturus*, a man with a long pole is prying the surface of the water. A greyish bit of jelly is afloat, and the scientist, when he captures it, will rush it to the tubs on deck. What sort of jellyfish will it turn out to be?

"Put out a Petersen," the log of the *Arcturus* will say for April twenty-two. "Petersen" is a kind of trawl invented by a Professor Petersen to sweep up fish a mile down. This entry in the log means that on Director Beebe's order a large net is pushed by cables into the water. At every hundred fathoms a net has

been tied to the cable, so that all depths of the sea will be combed. With its string of nets under water, the *Arcturus* steams slowly along for a while.

"Shall we have any luck?" wonder the scientists. The nets may come up empty, or full of weird forms.

The nets are brought up. The director and his men are having a busy time of it; the nets have to be emptied, the wriggling and groping forms sorted into the familiar and the strange.

"Take a look at this one!"

"Who knows what that is?"

"Look out!" Splash.

"The haul was excellent and there were many new fish," is the note in the log.

The rest of the day is spent in excited study of the catch, every scientist at his desk in the laboratory.

One afternoon from the deck of the *Arcturus*, a flat-bottomed small boat is lowered, and the director and two of his assistants row away. The *Arcturus* is lying off Tower Island, and there, close to the cliffs of Darwin Bay, the small boat is moored. One of the party unrolls a long metal ladder which dangles in the water. Then the director, clad in bathing suit and gym. shoes, climbs over the stern and down the ladder until, of his six feet of spare frame, only his head is visible. It is a fine head, long and narrow, with deep, lively eyes and a smiling mouth. From the floor of the boat his assistant now heaves up a heavy copper helmet. A rubber hose, hanging from the side of the helmet, lies coiled on the floor. The other end of the hose is attached to an air pump. The assistant fits the helmet over the head of Director Beebe, transforming him into a creature from another world. Through the windows of the helmet, however, the eyes of the

director smile reassuringly. Then, the pump begins to work; the helmeted head sinks.

Director Beebe steps into another world. He swings off the last rung of the ladder. All his movements, he knows, will here be different from those in air. Here, in the buoyant space, he can waft himself at will over cliffs. Even the sixty pounds of helmet feel light.

He sits down on a rock. He feels like a ghost in a ghost world. "What will the regular inhabitants of these haunts think of me?" he wonders.

On another rock, a few inches away, is resting one of these inhabitants. The director sees him as through a curtain. He is almost all head. He looks like a miniature bull, with two horns curving off his crown. His stubby body is splashed with red and gold and blue. His eyes are silver and purple.

"A blenny!" The human being knows the fish. He has one like him in his aquarium at the New York Zoological Park.

But the blenny sniffs at the human and swishes away.

Now the human fish is greeted by another aquarium acquaintance of his, a starfish, who is crawling over his hand as though it were part of the rock. To the fish, the stranger is merely another object brought in by the tide.

Most of the fish pay no attention to the human. "I have come to meet all the fish," thinks the air-breather, "and I shall."

He has brought bait with him, a dead crab, and he waves it about slowly. As the fragrance of food seeps through the watery atmosphere, the human finds himself overwhelmed with attention. From beneath rocks, from behind cliffs, from far and wide, dart the finny folk. The water is thick with them. They bump

against the windows of his helmet, they glide in and out of his fingers, all out for a nibble.

"Ah!" he exclaimed. A new fish has swum up; a high-backed fellow with orange-tipped fins and a white base to his tail. The helmeted stranger picks up his spear, thrusts out, and the New York aquarium has taken a new boarder. From time to time the man-fish thrusts out his spear in the same way. His aquarium acquires many new boarders.

He bends down with difficulty and upturns a rock. The mass of life clinging to it delights him—beautiful seaworms, hermit crabs, strange shrimps. "I must have some pails lowered," he thinks. "I can then collect specimens merely by drawing up rocks."

He turns, and confronts a boulder the size of a cottage. Behind the boulder stretches a blind, blue space. Suddenly, as he watches, part of the boulder begins to move. What he has thought to be a layer of greenish coral begins to sway. Long strands that he has taken for seaweed writhe and poke about. His heart leaps; an octopus is flowing past him.

The blue space shimmers, darkens, takes shape, and a nine-foot shark looms up. The grey hulk does not swerve from its path, but drifts along until it is lost in the blue shadow.

The helmet, too, rises through the bluish space. Slowly the human form wafts itself up the ladder. A moment more, and the head of Director Beebe breaks above the waves.

III

"Tell us about it! How did you feel down there?" every one asked him when he had lifted off his helmet.

"It's marvellous, it's great!" replied Beebe. "It's

like a visit to Mars. Everybody—man, woman, and child—ought to get or make a helmet and a rubber hose, and step under water. And everybody will when people find out how simple it is. It's less trouble than going up in an aeroplane, and safer than walking across a busy street. And the thrill is like visiting a new world."

That was just like William Beebe, the director of scientific research of the New York 'Zoo.' So enthusiastic was he about all nature's works, that he couldn't understand people who were not. Fascinated by a natural wonder, he must tell the humdrum world about it. Book after book he has written, as fascinating as volumes of Nature herself. Indeed, to many people Nature is only enticing when this poet-scientist displays her.

As a boy in Brooklyn, where he was born, birds interested him most. He learned to distinguish the songsters from the dumb tree-sparrows. When the first snowbird appeared with the white in his tail, the young bird-lover used to scatter crumbs and nail suet to the trees.

"Ice is the enemy of birds," he said. "They starve in winter." In the song and society of his winged comrades, he felt repaid for his forethought.

His eyes glued to opera glasses, Will Beebe examined the tops of trees and houses. For that matter he examined everything else. He put his pocket lens over a fragile jewel of a snowflake on his coat sleeve. He poked a stick in the knot-holes of trees, stirred the dead leaves, and then peered in. When two yellow eyes greeted him, he would reach in with a gloved hand and gently bring out the screech owl, examine him, and with a pat, free him. In deserted sheds he looked for

bats, in garrets for spiders. At night he wrote about them all in his journal.

"Why do moths and millers wrap themselves in cocoons, but butterflies hang by one loop of silk, uncovered?" he wondered. "Why is the top of the weasel's tail always black?" Questions like these he put down in his journal.

Often he brought home a handkerchief full of frozen leaf-mould of decayed wood. This he emptied in a dish and watched, as in the warmth of the house a world was born. Insects hatched, tiny plants sprouted.

Will Beebe was bound to become a naturalist. Shortly after he graduated from Columbia University in 1898, he joined the staff of the New York Zoological Park. His position was that of Ornithologist. That meant that he was an expert in bird life. Later, he became the Director in Charge of Scientific Research.

Once the director became interested in the rare pheasants that live in Asiatic jungles. In the Western world little was known about these brilliant birds. Beebe packed his instruments, his camera, and gun, and was off for India.

"Isn't it dangerous?" asked his friends in New York.

Beebe laughed. He feared but one thing, failure to get what he went for. All the same, death missed him more than once. In Ceylon, his servant saved him from being struck by a poisonous viper. He was attacked by a herd of wild water-buffaloes and retreated up a tree just in time. Among the hill folk of the Himalayas, a poisoned arrow was shot at him, but missed its mark. Once, on the trail of a covey of blood pheasants, he hurtled down an icy ridge towards a sheer precipice.

Again death missed him, as it did in a Malay jungle when he was stricken with fever.

But he got what he went for, and in 1918, for his discoveries in the lore of pheasants, the National Academy of Sciences awarded him a prize. A prize he valued more, however, was his experience with the jungle. It had gripped him.

"The jungle," he thought, "is the naturalist's heaven, for it is one of the two places left on earth where he can study wild life. The other is at the bottom of the sea. And soon man will wipe out the last jungle."

He had better hurry to it, he thought. He took his staff and his laboratory, and set up camp in the jungles of British Guiana.

"But it isn't safe," people again said.

Beebe was scornful. "Safer than Broadway. Certainly more peaceful."

Now when he got what he wanted of the jungle, and had turned his discoveries over to the scholars, a boyhood curiosity again awoke in him. For even in those early days he had lain on a bank in the woods, his gaze fixed in the clear water of the brook, and wondered:

"Can those fish see? Can they hear, or smell? What a delightful sensation it must be to rise and fall at will!"

On a steamer bound for Florida, he had followed the flight of a loon as it plunged into the waves. "What a story he could tell of life among the jellyfish!" Beebe had exclaimed.

"But, alas," he thought, "that must for ever remain a mystery to man. He may sail his ships above; he may peer down; even descend a few feet in a suit of

rubber or a submarine boat; or send a dredge down; but that is all. Who shall sound the mysteries of the sea?"

He welcomed every opportunity to explore life in the sea. "Everybody ought to have a helmet, and take a tour under water," he exclaimed. For years he dived, mostly on the coral reefs in West Indian waters. At the bottom of thirty feet of water, he felt quite at home. Helmet-hooded, he would sit down on a rock, lay aside his spear, draw forth a zinc pad and pencil, and calmly describe life round him. He even had a movie camera brought down and 'shot' his fishy friends.

But Will Beebe was never satisfied, never at rest. Now he was dissatisfied because, it seemed, he could not visit the sea below thirty feet. Human beings were built by nature to live at the bottom of an ocean of air. If they descended far into the sea, where the pressure of the water is too great for them, they were crushed. Will Beebe was dissatisfied because he could not go down deep in the sea. Every time people congratulated him on his exploration as far down as one hundred and fifty feet under sea, he thought of the realm a half mile down.

"There must be some way of getting there and coming back," he kept puzzling. "Some machine . . ."

IV

One morning in the summer of 1934, a barge bobbed quietly in the waters east of Bermuda. A crew of about twenty were on deck at posts of duty, and among them the commanding figure of Director Beebe. But the centre of interest was a huge steel sphere at rest

on the open deck. It looked like the helmet of some fabled giant diver. Were the sphere not resting on its wooden skids it would hang suspended from a cable which stretched from its top to the overhead boom and ran back to a drum alongside the winch. Another cable, bearing electric and telephone wires, pierced the top. An open manhole showed the sphere to be hollow. Into it men were putting, among other things, two oxygen tanks. Outside, the sphere read:

NEW YORK
ZOOLOGICAL SOCIETY
BATHYSPHERE

NATIONAL
GEOGRAPHIC
SOCIETY

Ten o'clock. Into the manhole of the 'bathysphere' crawled William Beebe and Otis Barton. A woman, standing near the cable-drum, hooked on her head a telephone apparatus, and picked up a note-book and pencil. Beebe adjusted his ear-phones and mouthpiece, looked to his writing pad, his camera. The two men inside the bathysphere braced themselves against the curved sides, and the director, his head framed in the round port-hole, nodded.

The four hundred pound door clanged shut, and the men bolted and pounded it down. The winches began to grind. The sphere trembled and rose on the cable. Ten men heaved, and it swung out over the side of the barge where it hung a moment. The captain signalled. Slowly descended the sphere. Five thousand pounds splashed. The water seethed and smoked, and the huge ball with Beebe and Barton locked in it sank into the sea.

Inside the sphere, the two men leaned against the two windows and looked out into a blue-green haze.

"Twenty feet," said a voice in Beebe's ear.

"Rays of light like those coming through cathedral windows," he murmured in response.

The telephone was in order. His words were being recorded on deck.

The twilight deepened and a dusky chill smote the windows. Then a cloud of brown thimble jellies drifted by. A fish, strange yet familiar. Beebe was puzzled. "A pilot fish, of course," he exclaimed. He had not recognized it in this changed light. . . . Now a ghostly jelly. . . . Here a shower of brown bubbles, a flying snail.

"Two hundred and fifty feet," said the voice in his ear. A sun-jelly. "Aurelia," he announced into the mouthpiece. "An uncommon depth for Aurelia," he thought.

Lantern fish . . . two bronze eels nosed at the window. He spied a gang of transparent shrimps.

"Six hundred feet." Men had sunk to this depth before, but they had been dead men.

Out of the gloom tiny lights flashed. The steel monster had come to the deep home of creatures who carried their own torches, like a watch with a phosphorescent face. . . . A jellyfish bumped against the glass, its transparent stomach filled with a pale mass of food.

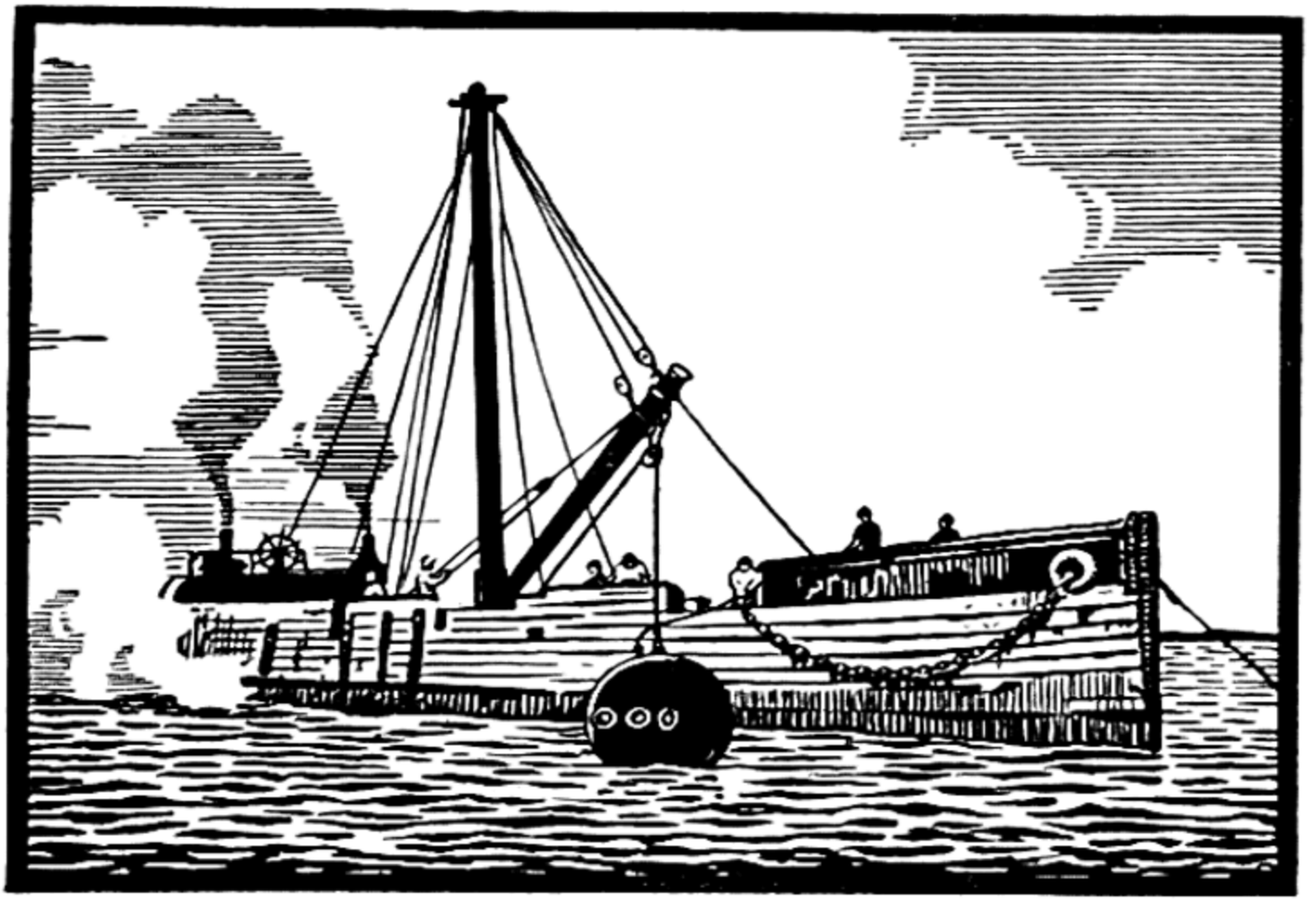
"Eight hundred feet."

"Look!" Beebe pulled Barton over to his window to see a beautiful silvery hatchet fish, its body aglow with lights. Beebe despaired of ever being able to describe the strange colour of the space into which he

looked out. Blue, he might call it, brilliant blue. But it was blue without light, though penetratingly clear. The blue of blind men, perhaps.

"Nine hundred feet."

Barton twisted sideways and threw his flashlight at the dials and tanks.



SLOWLY DESCENDED THE BATHYSPHERE

"Oxygen nineteen hundred pounds," said Beebe to the mouthpiece. "Humidity, fifty-five per cent. Temperature eighty-five degrees. Hose all right, door all right. Barometer, seventy-six and a half. Walls getting very cold. No fish, only little lights now and then."

"One thousand feet."

Suddenly Beebe looked towards the walls of his submarine prison, and started. Drops of moisture were trickling down the sides. A moment and he was

again calm. There was nothing wrong; merely the sweating of the cold walls. But it had roused in his mind the perils of his situation. Twenty-three hundred tons were now pressing on the steel tank or, as Beebe had named it, 'bathysphere'—sphere of the deep. If the window cracked, there'd be no use swimming out, because the pressure of the depths would crush them to shreds, food for the squid shooting across their path. If the cable broke, they would sink another mile, and spend the last breath of oxygen to make a note on the shells at the bottom. These were just two of the many chances they took.

The dense gloom grew denser. Pale grey creatures —oh, yes, mouth-fishes—floating.

"Thirteen hundred feet."

"A fish swam right up to the window and moved about. It had decided lights coming out of its sides, and big nostril-like lights."

A lapse of eight minutes.

"Sixteen hundred feet."

"Many worms, can see lights on window glass, as many as fifty. . . . Big fish after two others. . . . Saw shrimps sending out light. I saw them, in their own lights, send sparks out like sky-rockets. This explains much that has puzzled me, and is the biggest discovery yet."

"Eighteen hundred feet."

"Here's a fish with nothing but teeth illumined."

"Nineteen hundred feet."

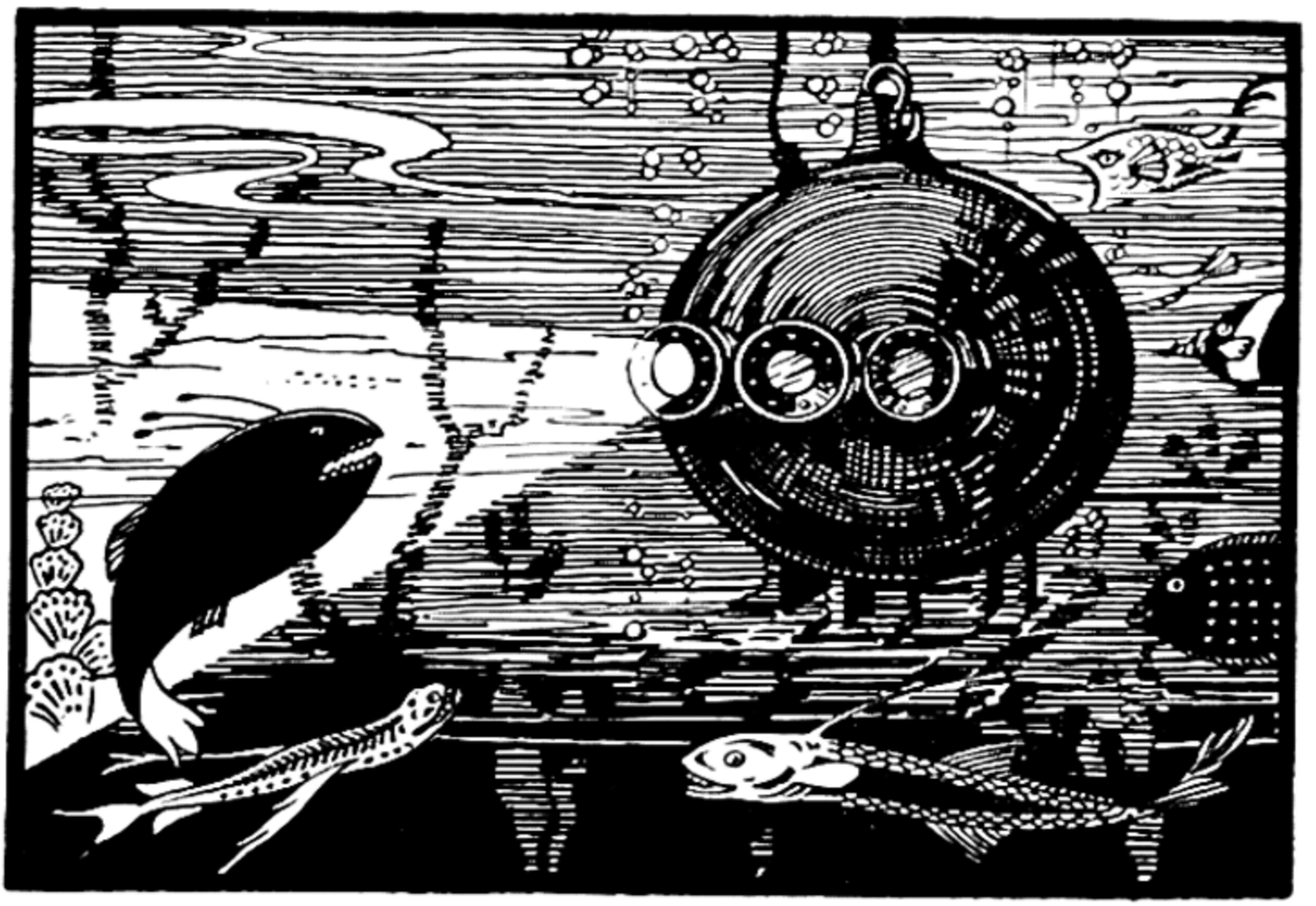
"Sides of bathysphere very cold."

"Two thousand feet."

"Lights here are great . . . sixteen hundred and fifty pounds oxygen; humidity, sixty per cent.; temperature, eighty-six degrees."

Into this black void, no light can penetrate from above. There is no day nor night, no summer nor winter. Only those dancing lights.

A flash of fangs outside the window: six sabre-toothed viper-fish. . . . Suddenly, into a sea of shrimps, two large fish with tail lights dashed. A sea tragedy.



SEA-DRAGONS SWARMED INTO VIEW

"Twenty-one hundred feet."

"Now there are ghostly things in every direction, like meteors. . . . Have never seen such a dark place."

Sea-dragons swarmed into view, with open jaws and a string of pale lights along their bodies and lighted fangs. This kind of sea-dragon was unknown to man, and Beebe named it "Untouchable Bathysphere Fish."

Into his ear the voice said, "Twenty-four hundred and fifty feet."

"It is icy cold in here," replied Beebe. And ten minutes later, at twenty-seven hundred and seventy-five feet, he exclaimed, "So black outside, can't look; and what lights!"

"Twenty-eight hundred feet."

"Marvellous outside lights. Water filled with lights."

"Three thousand feet."

Sunk more than half a mile in the sea, Beebe felt like an atom hanging on a cobweb in the dark. Barton turned his flashlight towards the dials. Everything was shipshape. But at three thousand and twenty-eight feet, the voice in Beebe's ear told him that on the deck of the barge away above them, there remained only a few more turns of the cable left on the reel. The steel ball was withstanding seven thousand tons of water. His fingers were numb from the frozen window-sill. His eyeballs hurt from straining into the brilliant mystery. The points of light went on winking as they and the stars had winked for æons past. The steel sphere began to rise. Director Beebe kept murmuring into the telephone, his companion kept taking photographs.

One hour later, the sun-drenched people on the deck of the barge saw the bathysphere break the surface of the sea. Ten minutes more, and out of the steel ball crawled the cramped forms of the two men who had been the first to come back from another world.

Beebe was thoughtful. He realized that no one had ever known the abundance and the strange forms of life in the lower regions of the sea.

"Soon the bottom of the sea will be the only place

left to Nature's creatures," he had once exclaimed. "Who shall sound the mysteries of the sea?"

Now he had given himself the answer. From daring scientists like Beebe, not even the sea can keep its secrets. With poets like William Beebe to teach them, men may yet know the truth of all mysteries.

JOSEPH HENRY

HIGHS AND LOWS

If the sun goes pale to bed
'Twill rain to-morrow, it is said.

Pale Moon doth rain,
Red Moon doth blow,
White moon doth neither rain nor snow.

The difference between the day of these proverbs and this day of weather forecasts is the career of Joseph Henry. He made a new kind of map.

ONE morning at a little past ten o'clock, in the red brick building of the Smithsonian Institution in Washington, the secretary, Joseph Henry, was engaged in a strange occupation. On the wall hung a large map of the United States. First Professor Henry peered at a paper in his hand. Then out of a heap of cardboard squares of assorted colours lying on a table alongside, he picked a pink one. This he pinned to a dot on the map marked "New York." On Cincinnati he pinned a blue cardboard, on Boston a red one. Each time before he chose the cardboards he consulted the paper in his hand.

Some men were watching him. "Professor Henry," said one, "the United States will remember the year 1849 because of this map."

"The map does show the weather throughout the country at a glance," replied Henry. "It will do more. The daily weather map will help us foretell the weather."

The men realized that they were looking at a new thing—the first accurate weather map. With words

of praise they congratulated Professor Joseph Henry, who had invented the map. But as usual the professor was modest. He gave everybody credit for the invention—his friends, the telegraph companies, the Smithsonian Institution, every one but himself, who had earned it.

His modesty and devotion to the cause of science had kept him in the humble post of Secretary of the Smithsonian Institution. The University of Pennsylvania had offered to appoint him Professor of Chemistry, with double the salary he was getting. At the university his work would have been much easier than it was at the Institution. Half the time he would have been free to continue his own scientific work. It was the kind of position he had always hoped for. Nevertheless, he replied, "Gentlemen, this is a great honour you wish to confer upon me. I must, however, decline your kind offer. I cannot leave my work as Secretary of the Smithsonian Institution unfinished. That work comes first."

Professor Henry had a most responsible task. James Smithson, of London, England, had willed a large sum of money to the United States to establish an institution, "for the increase and diffusion of knowledge among men." For ten years the United States Congress had pondered these words of Smithson. What is the best way to increase and diffuse knowledge among men? Various plans had been suggested: a national university, a public library, a literary magazine. After ten years of wrangling, Congress had been wise enough to turn the matter over to Joseph Henry.

"But who is Joseph Henry?" people asked.

American scientists agreed, "Joseph Henry is the best man for the job."

The most famous European scientists said, "The mantle of Benjamin Franklin has fallen upon the shoulders of Henry."

"Henry has no superior among the scientific men of the country," said the noted Professor Silliman of Yale.

"He has no equal," Professor Renwick corrected him.

As a boy Joseph Henry had gone to a country school, afternoons only. Mornings he had worked in the village store. Maybe it was to his rabbit that he owed his great learning. One day, chasing his pet, he had to crawl after it through a hole in the foundation wall of the village meeting-house. He was attracted by a glimmer of light through the broken floor. Working his way upward to the light, the boy found himself before an open bookcase containing the village library. He took down a book and, musing through its pages, forgot the rabbit. From then on he frequently crawled into the hole in that wall. He told the story of his reading to his comrades, and it reached the ears of his employer, who got permission for him to go to the library by the front door.

His first great ambition had been to become a writer of plays. He had even organized a theatre, the Rostrum, of which the boys had elected him president. He wrote plays and the Rostrum produced them.

But one day during his sixteenth year, he came upon a curious book. It began: "You throw a stone or shoot an arrow upward into the air; why does it not go forward in the air, and in the direction you give it? What force is it that presses it down to the earth? Why does flame or smoke always mount upward? You look into a clear well of water, and see your own face and figure, as if painted there. Why is this?"

Joseph Henry was puzzled. He could not answer these questions. What were the answers? Really he must learn Science. He resigned as president of the Rostrum.

He learned the answers to those scientific questions, and proceeded to tackle harder ones. In time Joseph Henry came to know more about electricity than anyone in the United States. Long before Morse invented the telegraph, Joseph Henry was sending currents through long coils of copper wire. This excited a magnet and moved a lever at one end of the wire. The lever struck a bell; the idea for the telegraph was born. Without Henry's discoveries, Morse's telegraph would have been impossible.

Therefore, a noted scientist had said, "Henry has no superior among the scientific men of the country." And another had remarked: "He has no equal."

That was why in 1846 Joseph Henry, then a professor at Princeton University, was chosen by Congress to organize the Smithsonian Institution.

"The will of James Smithson," reported Henry, "means exactly what it says. To increase knowledge we must do research in science; to diffuse the knowledge we must publish the knowledge for the world."

So the famous Smithsonian Institution had begun its work, and the idea of mapping the weather had come to Professor Henry. "Let us establish a number of stations to study the weather throughout the North American Continent," he proposed.

He remembered that Benjamin Franklin was once on this track. At that time Franklin, in Philadelphia, wrote to a friend in Boston that an eclipse of the moon was due on a certain night. Franklin suggested that his friend should note the eclipse in Boston, while he

would do the same in Philadelphia. On the evening of the eclipse an unusually severe north-easter set in at Philadelphia, and Benjamin Franklin was unable to make any observations of the eclipse. Since the wind blew fiercely from the north-east, Franklin reasoned the storm must have reached Boston before it came to Philadelphia. But to his astonishment he heard from his friend that the night of the eclipse had been clear in Boston, and that a terrific north-east wind and rain-storm had begun there early the next morning. That puzzled Franklin.

He immediately inquired and found that the storm had struck all places south-west of Philadelphia even earlier, and it had travelled north-east in the direction of Boston, which it did not reach until twelve hours after it had struck Philadelphia. "How can I explain this?" wondered Franklin. He hit upon the following idea: the wind always blows towards the centre of the storm. Therefore the north-easter came because the storm, advancing from the south-west drew the air powerfully from Boston towards Philadelphia. The nearer the storm approaches, Franklin discovered, the more violently blows the wind; when it passes the reverse happens: the farther it recedes, the less is its force.

"Certain storms, which are like eddies in a stream, suck the wind towards themselves; the wind therefore blows opposite to the direction of the storm," Franklin had announced. He made the further discovery that most storms across the United States move from west to east.

"Franklin could only observe one storm now and then," thought Joseph Henry, about a century later. "To map the weather, we must have our eyes on all

America at once. We shall set observers watching at various stations in America. They shall telegraph their reports. In this way we can follow the path of storms, and warn all places in its path."

When Joseph Henry was making the first weather map in the red brick building of the Smithsonian Institution in Washington, he held in his hand telegrams from his observers throughout the United States. The telegrams reported on the temperature, the clouds, the direction and the force of the wind. The coloured pieces of cardboard, which the professor was putting on the map, were symbols of these different items. It was a clever way of picturing weather conditions.

The professor put some arrows on the map. That was to show the direction of the wind.

"We shall no longer have to rely on weather proverbs, which are frequently false," Henry remarked.

"We shall learn the true causes of the weather; for instance, why the winds move across the United States usually from west to east."

Using the newly invented telegraph, Joseph Henry made the world's first accurate weather map.

II

From Joseph Henry's experiment, the highly efficient United States Weather Bureau has grown. Every morning at eight o'clock, Eastern Standard Time, which is seven o'clock at St Louis, six at Denver, and five at San Francisco, observers at about two hundred and fifty stations scattered over North America and the West Indies take their weather observations. At eight o'clock in the evening, Eastern Standard Time, they again note the weather. They do not glance

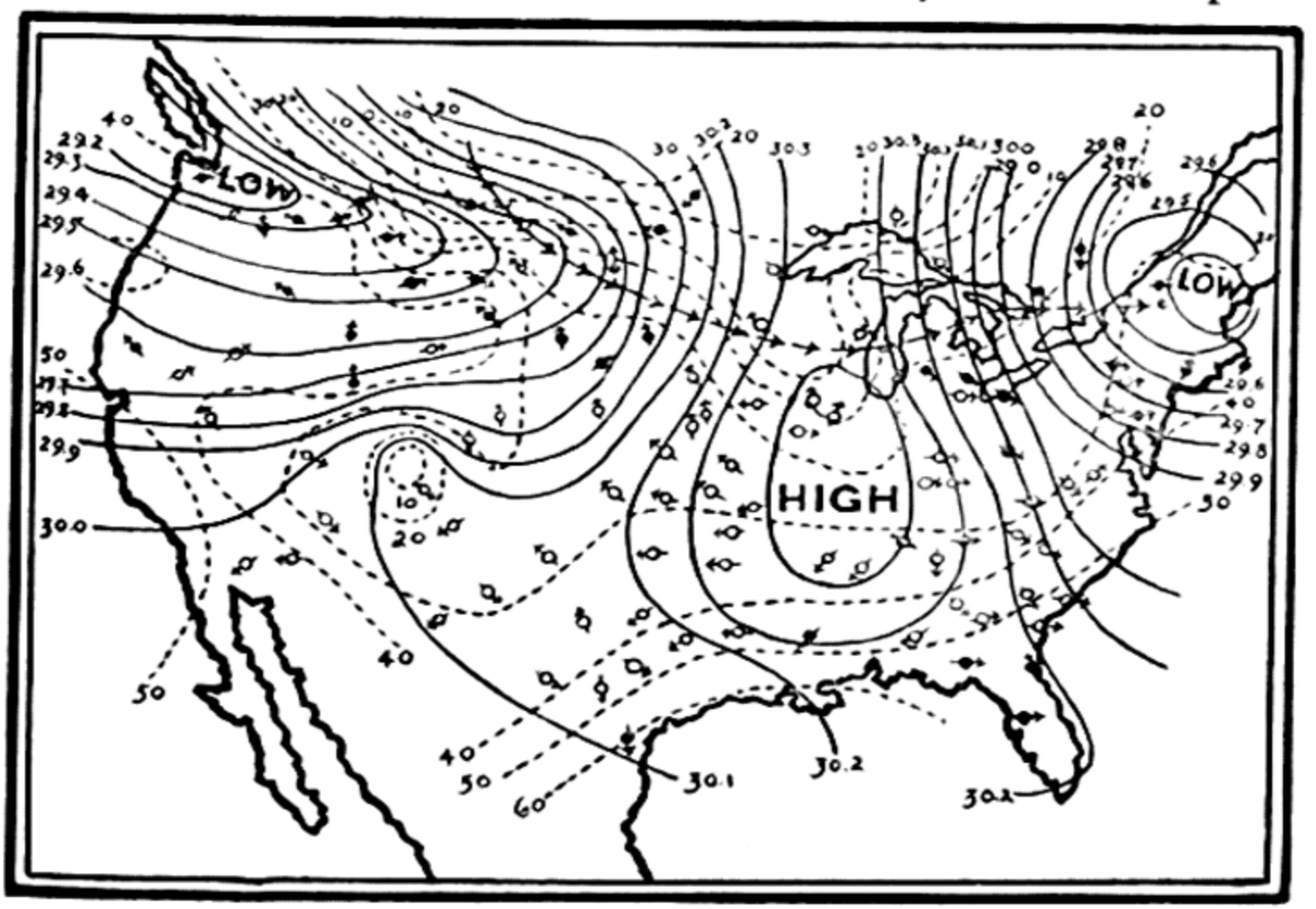
casually at the sky, or consult their rheumatism. They read accurate instruments. These include various types of thermometers; a barometer, which measures the pressure of the atmosphere; a rain gauge; and various instruments that tell the direction of the wind, and its force; and the amount of humidity, or moisture, in the air. The men also note whether the sky is fair or clouded; if clouded, with what kind of clouds. During the next hour these messages speed over the telegraph lines to Washington, so that within two hours all cities with Weather Bureau stations have made up their weather map.

Many intelligent people, passing by the window of their Weather Bureau, stop to take a look at the map. Their remarks are usually one of two kinds. Either they say: "There's a 'high' coming this way. We shall have fine weather." Or: "A 'low' is on its way. We're in for some rain, or a warm spell."

They are referring to the wavy black lines on the map—the isobars. Isobars are drawn through places having the same pressure of atmosphere. Atmospheric pressure is told by the barometer. Now there are high-pressure areas, called 'highs,' and low-pressure areas, called 'lows.' A storm is an atmospheric eddy. If the eddy occurs in a low-pressure area, the air is drawn to it. That means warm, moist, or rainy weather. If the eddy occurs in a high-pressure area, the air is driven from it. That means cool, settled weather. This is one of the main principles of weather forecasting. Such forecasts are telegraphed daily to seventeen hundred different stations in the country.

Sometimes the 'weather man,' or forecaster, is wrong. That is because the low areas and high areas do not always follow the expected paths. They may sud-

denly shift their courses and upset the forecast. It is not the weather man's fault. Even so, he is right at least eighty-five per cent. of the time. His work, broadcast through radio and telegraph, to captains at sea, air-pilots, and anxious farmers, saves the country millions upon



A WEATHER MAP

millions of dollars every year. Let the country never forget Joseph Henry.

III

Exploring the air has taken a new turn with another professor, Auguste Piccard, a Swiss.

The earth is a ball that swings through space surrounded by its atmosphere. The heaviest part of this atmosphere lies nearest the earth's surface, and is called the 'troposphere.' In the troposphere winds

and clouds form, and the weather changes. There human beings make their home, because there the atmosphere has enough oxygen for them. Leaving the earth and climbing up into the heavens, one finds that the oxygen grows less, and the air grows lighter. About ten miles above the troposphere lies a region called 'stratosphere,' where neither wind nor cloud can form, where the stars shine by day, where human life cannot exist.

"What would our instruments tell us about the stratosphere?" wondered Science. "What would our thermometers, our barometers, our electrical instruments record there?"

Professor Piccard determined to go up and find out. He laid plans to explore the stratosphere.

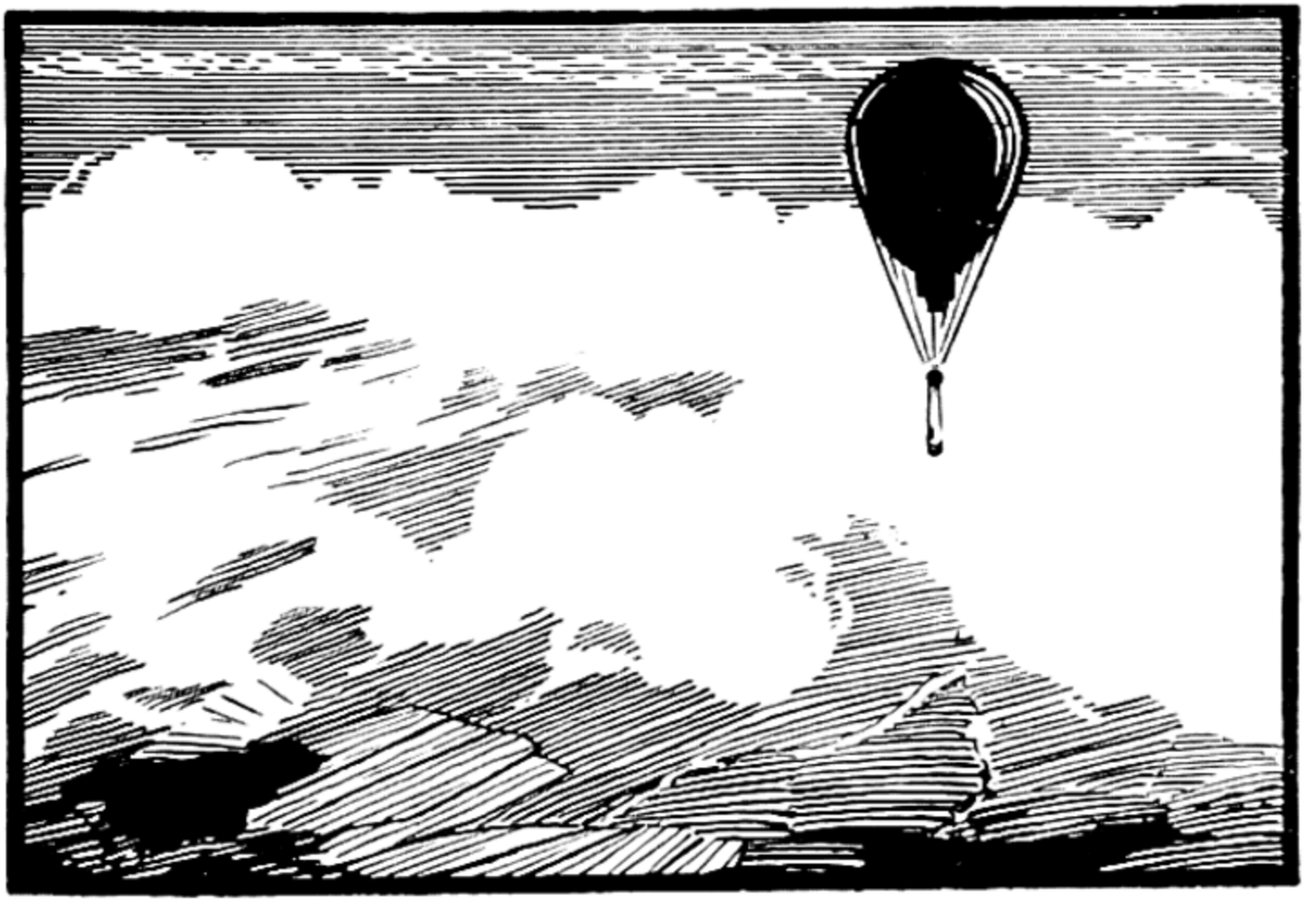
Before dawn on May 27, 1931, Professor Piccard and Paul Kipfer, his engineer, put their instruments, a few tanks of oxygen, and some lead ballast into a balloon, and then stepped in. The balloon was a huge bag attached to an air-tight ball made of aluminium—the lightest metal that they could have used. It was just big enough to allow the men to stand inside, and had two manholes and eight round windows.

As soon as the men stepped inside, the manholes were sealed up and the balloon released. Like a shot it soared into the air. Twenty-five minutes later, Professor Piccard remarked that they were over eight miles up, and still soaring. The barometer showed one-tenth the pressure of the atmosphere on the surface of the earth. Outside the aluminium sphere there was no breath for human lungs.

At the height of almost ten miles above the surface of the earth, Professor Piccard looked down. The earth was a marvellous, a terrifying sight.

"The earth seemed at times like a huge disc with an upturned edge," Piccard told afterwards. "The bluish mist of the atmosphere grew red-tinged, and the earth seemed to go into a copper-coloured cloud. Then it all but disappeared in a haze."

He looked up. The moon shone brilliantly.



LIKE A SHOT IT SOARED INTO THE AIR

Danger! The oxygen tank broke. No sooner had they repaired it than their sealed cabin sprang a leak. They plugged it up.

Miles above any protecting clouds, the side of the cabin facing the sun became heated until it was unbearably hot inside. After six hours in the stratosphere, Piccard decided to pull the valve rope which let out the gas, and begin a gradual descent. To his horror the valve jammed, and he could not release the

gas. Their only hope lay in the cooling of the gas. The gas would contract, and the balloon would sink. But they could not hang in the stratosphere indefinitely; their supply of oxygen was running out. Meanwhile, the heat was becoming intolerable, a hundred and six degrees. Outside their air-tight ball the temperature was about a hundred and fifty degrees below zero.

Death threatened from another quarter. In their attempts to disentangle the valve rope a barometer had been broken, and the mercury from it was dripping on the aluminium floor of the cabin. Mercury eats its way rapidly through aluminium. When it got through to the outside of the sphere their adventure would be over. Hope now depended on the answer to a complicated question. Would the coat of varnish covering the ball hold the mercury long enough for the gas to cool before the oxygen ran out? The men waited.

Slowly the sun moved down towards the horizon. The temperature fell; inside the ball the men shivered with cold. But the balloon had begun to descend. The danger now was that it might gather too much speed and fall like a stone. To steady the fall the men threw out the lead ballast. By this time they were hovering over the Alps, above the sharp points of snow-capped peaks and dangerous glaciers.

That evening, the anxious relatives, friends, and fellow scientists on the earth's surface, peering through binoculars, saw the strange balloon come to rest on a glacier high in the Alps. The ball opened, and Professor Piccard and Paul Kipfer crawled out. They had returned from their journey of exploration into the windless region ten miles above the earth, where the stars shine by day, and where there is no weather.

JOHN MILNE

INSIDE THE EARTH

The surface of the earth has been mapped. Auguste Piccard has soared ten miles into the stratosphere. William Beebe has dived a half mile into the ocean. That leaves but one new kind of exploration: the inside of the earth. There has been only one expedition into the core of the earth, the one in Jules Verne's romance A Journey to the Centre of the Earth. *Among real people, however, there was an Englishman who began the exploration of the inside of the earth.*

IN 1876 the young Englishman, John Milne, arrived in Japan, after having travelled half-way round the world to get to his new job as teacher in the Imperial College of Tokyo. Both Japan and its people seemed strange to him. The 'Hermit Kingdom,' as Japan was then called, had just opened its doors to the Western World. One of its first invitations had been sent to the scholars of the West. John Milne, then a mining engineer, had accepted the invitation.

That was like him. "I am a man of the world. I am used to being far away from home," he might have said. "When I was a boy I took a holiday trip to Iceland, alone. I like to travel."

As a graduate with honours from the Royal School of Mines in England, he had worked for a time in the mines of Cornwall and Lancashire. There he did not stay long, for his brilliance had attracted the attention of Cyrus Field, the American who laid the first telegraph cable across the Atlantic Ocean. Said Mr Field to the twenty-two-year-old engineer, "We want to know what minerals there are in Newfoundland

and Labrador. Make maps to show us where these minerals are located, and tell us whether it would be worth mining for them."

For two years Milne had worked hard at this. When he had completed his survey, he went off to Funk Island for a vacation. Funk Island is a rock about thirty miles from Newfoundland. Once it was the home of the great auk, an extinct fowl as large as a goose, with wings too small for flying. Now the great auk was no more, and Milne went in search of its remains. He succeeded in making a collection of the skeletons of fifty birds, some of them larger than any known before. These he gave to the museums.

Then he had gone back home, in time to learn of an expedition ready to sail for Egypt, where it would march across the desert to explore the country about Mount Sinai. For Milne this was an opportunity to investigate the rocks of that country. Off he went. His exploration of those rocks turned out to be so thorough that it called the world's attention to him. He was well known now, and on his return found an invitation awaiting him to go to Japan to teach mining engineering. It was just like him to say promptly, "Certainly, I'll go."

It was also like him not to go the usual way, by sea. Instead, he made his way alone across Europe, Siberia, and Mongolia. No railroad then crossed Siberia. The journey took him eleven months, filled with adventure and hardship. For instance, he had to travel once through a wilderness. For thirty-one days he pushed across the empty wastes of ice and snow. On January 11, 1876, he finally reached the Great Wall of China. A few months later he took the boat to Tokyo from Shanghai.

Japan greeted him strangely. On the night of his arrival in Tokyo, the earth quaked.

II

Earthquakes for breakfast, dinner, and supper; earthquakes to sleep on. That was Professor Milne's experience. At midnight on the 22nd of February, 1880, the earth quaked more violently than usual. Chimneys crashed, roofs were demolished. In the morning Yokohama looked like a bombarded city, with the dead and wounded lying in the highways. "What can we do? How can we prevent this terrible loss of life?" Milne wondered. "The earth trembles for a few seconds, the solid ground gives way under your feet, you feel sick. The walls of your house collapse like a house of cards. To top it all, fires break out among the ruins."

The young man was completely aroused. "What causes the earth to quake?" he asked. With that question he began the study for which he became famous.

In olden times people thought there dwelt inside the earth a monster which, when it moved, caused the earth to quake. What sort of monster? A great earth spider, said the ancient Japanese. Some disagreed. These said the monster was shaped like a catfish. At Kashima, sixty miles from Tokyo, there is a rock. That rock, it was believed, rested upon the head of the earth-shaker. That explained why, in this region, earthquakes are not frequent; but the rest of Japan is shaken by the wriggling of its body and tail.

In Mongolia the earth-shaker was said to have the form of a hog; in India, the form of a gigantic mole.

The Arabs thought it an elephant; the North American Indians thought it a giant tortoise.

Now Milne knew that an earthquake is due to strains in the rocks under the earth's crust. In places the strain is too great. The rocks then bend or slip and the earth quakes. This Milne knew, but no one at that time knew why earthquakes occur at one place and not another.

Milne often heard the low rumbling of the earthquake's approach. The sound grew gradually louder, and faint tremors were felt. Sound and tremors increased in strength until within a few seconds the eye saw the earth shake, the ear heard deep explosions. When the earthquake died down, it had left its human wreckage. "An earthquake is first of all a trembling," thought Milne. "Vibrations pass through the earth's crust. It is like the shaking of our houses when a heavy team rumbles past on the uneven road. The structure inside the earth is uneven."

Of all the earthquakes, the one that made the deepest impression in Europe was the one in Lisbon, Portugal. The city of Lisbon was engaged in its daily business on November 1, 1755. Suddenly a mighty noise was heard underground, like the continuous rolling of thunder. The ground shook violently, heaved, seemed to whirl round, and in a moment Lisbon was a heap of ruins and dead bodies. People fled from the fall of shattered buildings to the broad marble quay running along the waterside. All at once this quay sank under the waves, taking with it the terrified crowd, together with the boats moored there. Not a single victim, not a scrap of wreckage rose to the surface. The abyss had closed upon the quay, the vessels, and the people for ever. At the same time the sea, which had at first

receded from the shore, rushed back to the height of sixteen yards above its usual level, hurling its furious waves over the town. In six minutes, sixty thousand persons had perished.

While this was taking place at Lisbon, the lofty mountains of Portugal were being shaken so that they split and their summits broke off. The shocks were felt in Morocco, Martinique, South Africa, Greenland, and in the whole of Europe. Ships at sea were shaken as if they had struck on rocks.

But the land of perpetual earthquakes, Milne knew, is Japan. From earliest days earthquakes had destroyed entire villages of Japan.

John Milne thought, "There is something more important for me to do in Japan than just to teach engineering."

III

The eyes and hands of the world were concerned with the suffering of Japan. The excitement over the earthquake of 1880 was intense. John Milne threw his energies into the study of earthquakes, known as Seismology. He appealed to others. "All scientists must work together on this," he said. Before the ruins of Yokohama were cleared, he organized the world's first society for the study of earthquakes—the Seismological Society of Japan. For fifteen years he was the secretary of the society and the editor of the magazine. During the first ten years he might have said, "I am the Seismological Society." There came a time when he could not say that. He found he had interested everybody in Japan in seismology.

He began his study with these remarks: "We must examine the path of earthquakes. We must learn to

detect where they come from. We must be able to measure the shaking of the earth."

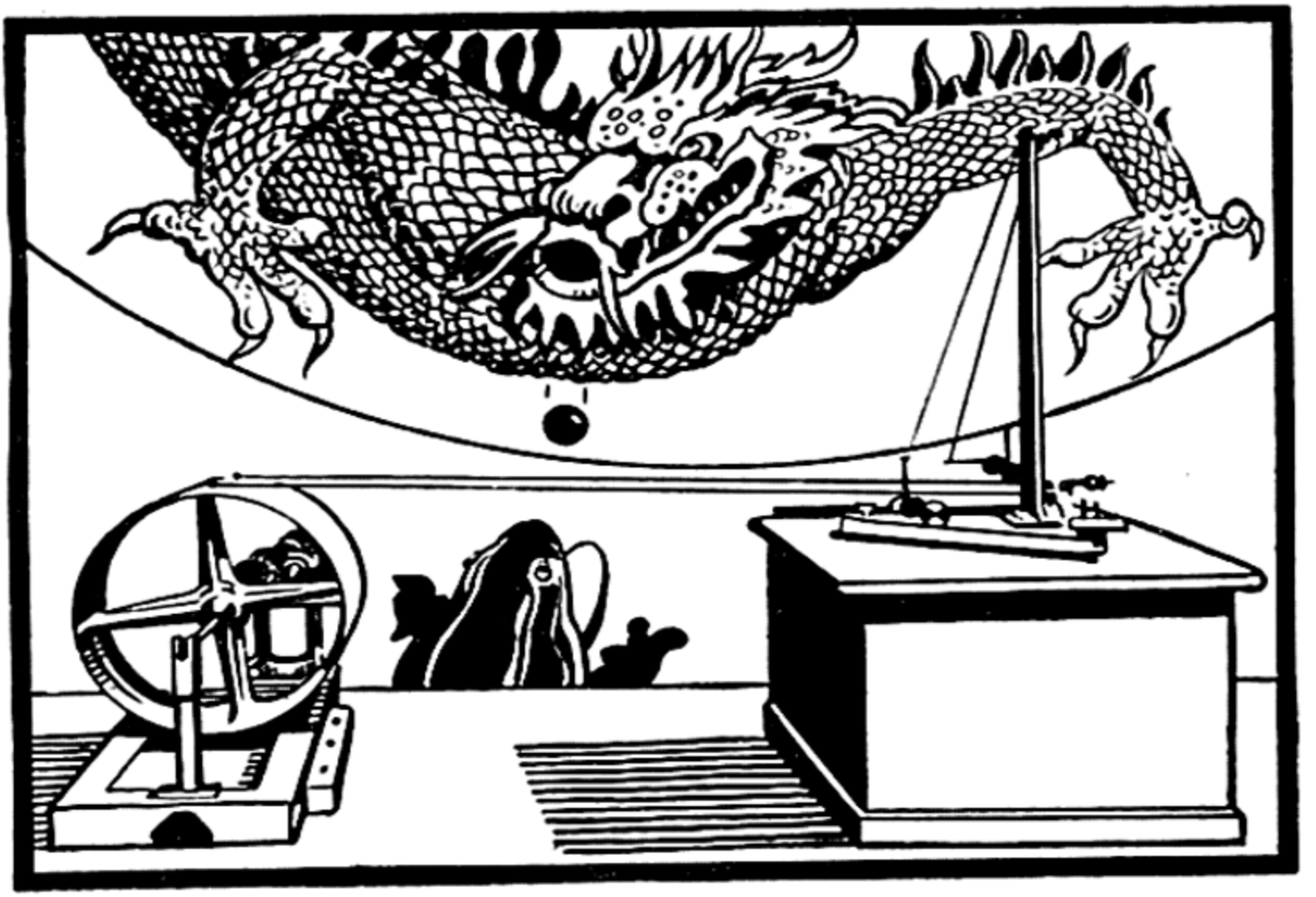
He knew that a Chinaman, Cho-ko, had invented an earthquake detector eighteen hundred years before. It was a hollow copper globe, ornamented with eight dragon heads, each facing a different direction, and with a ball in the mouth of each. Underneath every dragon's head was an imitation frog, so placed that it appeared to watch the dragon. If the ball were to fall from a dragon's mouth, it dropped into the upturned mouth of the frog.

Now inside the globe a pendulum was suspended so that it could move in any of the eight directions. When an earthquake occurred, the shock pushed the hidden pendulum forward. This set the ball rolling out of that dragon's mouth, and dropped it into the open mouth of the frog under it. If the frog on the northern side caught the ball, that was a sign of an earthquake in the south swinging the pendulum towards the north.

Once a dragon dropped its ball when no one felt the earth tremble. People therefore thought the instrument useless. Several days later the news came that an earthquake had taken place some distance away. The instrument that Milne had at hand, called the 'seismograph,' was, of course, much better than Cho-ko's. But John Milne was not satisfied with it. "It is not accurate enough," he said. When he finished working on it, however, it was a sensitive detector of earthquakes.

Whenever the earth quakes, the seismograph, like a newspaper reporter, begins to write an account of it. It writes with a point on paper which unrolls from a drum. When the earth is quiet and rigid, the line

that the seismograph writes is straight. But when the scientist, watching the line, sees it suddenly begin to grow wavy, he knows that the earth is quaking, and the seismograph is saying, "The earthquake is here, there. The shock is of these dimensions. Now it is over."



MILNE'S SEISMOGRAPH WAS A MUCH MORE ACCURATE INSTRUMENT THAN CHO-KO'S DRAGON

Having improved the seismograph, John Milne induced the Seismological Society to place about one thousand of them throughout Japan, and learned from them the stories of earthquakes not only in Japan, but in the islands of the Pacific—at the Philippines, Borneo, Australia, New Zealand. At last he was ready to make a map of Japanese earthquakes. He did it by dividing the map of Japan into two thousand rectangles. Wherever in those rectangles earthquakes

had occurred, he put a dot. A thickly dotted rectangle showed an earthquake area; a sparsely dotted one showed an area rather quiet and safe.

No part of the globe is entirely free from earthquakes. The crust of the earth, which is about thirty miles deep, is not steady. Underground the rocks bend, split, settle. In many parts of the globe, the earth shakes every half hour, but the shaking is so faint that it can be detected only by a seismograph. The earthquake map shows that the crust of the earth quakes most frequently along the eastern slope of the highlands of Japan, and along the western slope of the Andes.

Now looking at his earthquake map, Professor Milne wondered:

"How can we avoid the calamity of earthquakes? We cannot prevent the earth from quaking, but perhaps we can build our houses so that they will not crash during an earthquake."

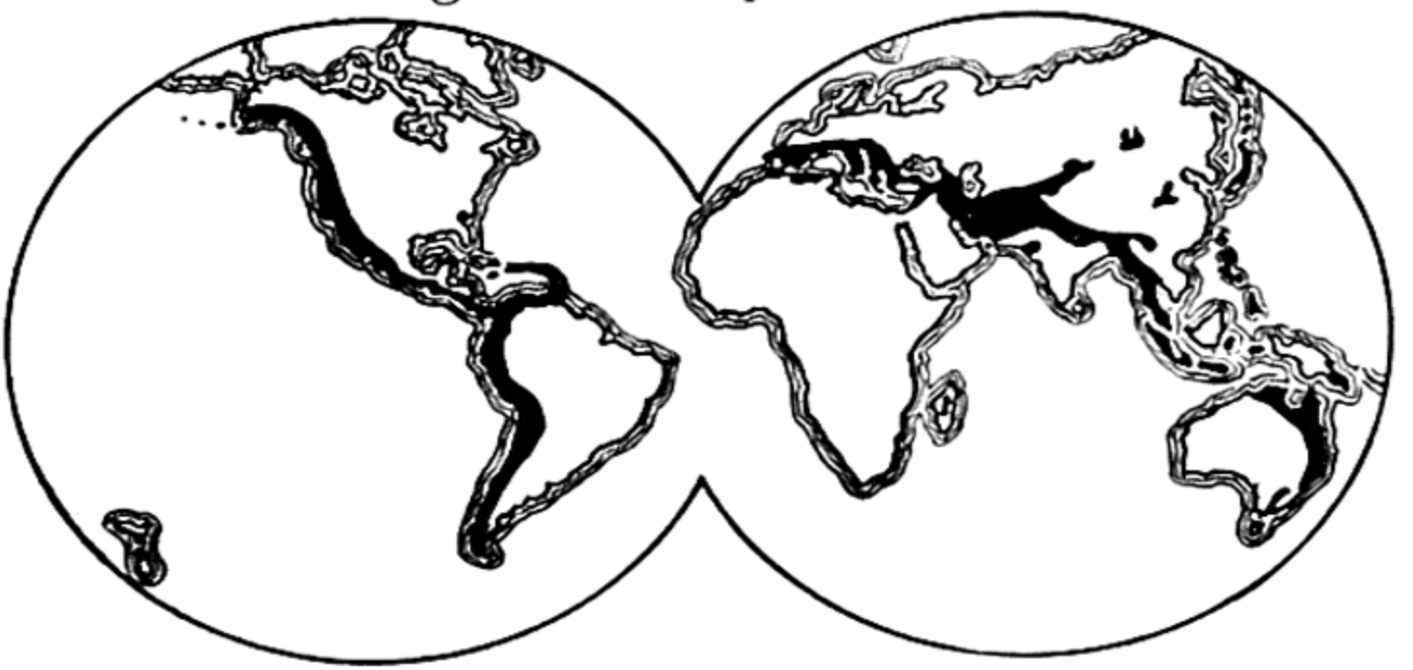
How many thousands of lives Professor Milne has saved will never be known. He taught the natives in the earthquake areas of Japan how to build their houses and bridges that earthquakes may not topple them. The new buildings in Tokyo are designed to withstand earthquakes. An earthquake-proof house, although it looks like an ordinary one, is constructed differently from the old type of house. It is never built on soft ground; it has special rafters hidden in the framework; its roof is very light. In Japan the damage of a severe earthquake nowadays is only one-fourth of what it might have been if it were not for John Milne and his fellow seismologists.

After twenty years in Japan the English scientist began to long for home. Appreciating how much

Professor Milne had helped their nation, the Japanese Government settled a pension on him and bestowed on him the "Order of the Rising Sun." And John Milne left for England.

IV

Although he was back in England, his mind still wandered among the earthquake areas of the world.



A MAP SHOWING EARTHQUAKE ZONES

The thought occurred to him, "Perhaps I can make a seismograph sensitive enough to detect an earthquake anywhere in the world." One day his friends visited him in his quiet house on the Isle of Wight to find the earth trembling there—on John Milne's seismograph. John Milne was watching the point of the machine record a quaking of the earth thousands of miles away.

"We must study earthquakes over the whole earth," he told scientists. "That is the only way we can explore underground." The world of scientists heartily agreed, and stations, furnished with Milne's seismograph, were scattered over the globe.

To him the stations reported regularly. He studied the information sent, located the exact spot of the earthquake, and put it on his map.

"It will take a long time," he said. "But we must succeed in making a complete earthquake map of the world." Nor did he limit earthquakes to dry land; for he proved that there are quakes beneath the floor of the ocean, sea-quakes which leave their mark in twisted and torn telegraph cables.

John Milne was not mapping the surface of the earth. He was mapping its underground chambers. With his seismograph he was exploring the buried forces of nature. He was building the science of Seismology, which is a branch of Geography. Not only had he vastly improved the earthquake detector, mapped many earthquake areas, shown how to build earthquake-proof structures; but he had accomplished a more magnificent feat: he had launched science on a voyage of discovery into the depths of the earth. In time the world will have a detailed map of those regions. It will have the exact answers to puzzling questions, such as: "Why does the earth quake more often and violently in the highlands of the Pacific than elsewhere?" At present the answer is still buried in the crust of the earth. But thanks to John Milne's science of Seismology, it will be brought to light.

GERARD MERCATOR

MAKING THE MAP

When the explorer has come back, he is met by a rather dignified fellow with a globe in his hand. The fellow is the very spirit of geography. But on earth he calls himself a map-maker—a cartographer. "Yes," he challenges the explorer. "You say you have discovered some place. What is its latitude, its longitude? Locate it on the globe. Be exact. It must be represented on the map." The map-maker is a scientist. In the schoolroom hangs a map, it may be of Europe or North America. It is made, the teacher will say, in the style of "Mercator's projection." That sounds forbidding, but the teacher is only referring to Gerard Mercator, once a poor boy in Louvain.

EIGHTEEN centuries ago, Ptolemy, "Prince of Geographers," studied a globe representing the earth. On it he carefully inscribed the Equator. He measured off lines parallel to the equator; these would be 'parallels' of latitude. He drew lines from the North Pole to the South Pole; these would be 'meridians' of longitude. When he finished inscribing these lines, he sketched in the outlines of the lands he knew. "Lines of longitude and latitude locate any place on the map better than words," he explained to his fellow scientists of Alexandria.

"But maps are more convenient on a flat chart," said somebody. "How would you draw these lines on a flat chart? Would they run the same way?"

"No, they can't be drawn flat," replied Ptolemy. He explained. "Take any flat surface, a piece of papyrus, say, and wrap it round a sphere. Can you make it fit smoothly?"

SRI PRATAP COLLEGE LIBRARY.
SRINAGAR.

"Certainly," said a self-assured youth. He was astounded, however, when he tried it. "I can't do it. There seem to be some folds of the papyrus left over. Somehow the papyrus doesn't fit."

"You are right. A flat sheet cannot fit a round object exactly," agreed Ptolemy. "Now let us think of some round fruit. Can you peel it, and flatten out its skin?"

"No, not unless I break the skin."

"Exactly," replied Ptolemy. "We cannot make the surface of a sphere flat." He pointed to the globe. "That is why we cannot flatten our map of the globe without changing it untruly. We cannot draw a flat map of the round earth accurately. If we tried it, we should distort the shape of the earth. Nevertheless we ought to have a flat map."

For a long time Ptolemy wondered, "How can I show the map of the globe on a flat surface without distorting the shape of the earth *too much*?" One day he hit upon an idea. He took a cone. Round it he fitted a piece of papyrus. It fitted tightly; there were no bulges. Good! He straightened out the papyrus which looked like the slice of a circle. A round surface tapering like a cone, he had discovered, can be flattened out.

He took the cone, which was hollow inside, and set it over the sphere. "The edge of the cone," he showed, "can be the Equator. Then I can draw on the cone lines parallel to the Equator; these will be the parallels of latitude. The vertex of the cone will stand for the North Pole. Very well; I draw lines from this North Pole to the Equator; they will, of course, be my meridians of longitude. Now I trace the whole thing on papyrus."

When he unfolded his papyrus, he had on it a network of straight lines radiating from the centre and curved lines parallel to the circumference. With these as guides he mapped the outline of the world he knew. He knew the latitude and longitude of Alexandria, for instance. On his network of lines there was only one point where he could put Alexandria. So for the rest of the world. He showed his map to the other geographers, remarking that it represented about half the world.

"Imagine the globe of the earth cut in half through the Equator. Here is a map of the Northern Hemisphere. The world south of the Equator could be mapped the same way. Notice that once you know the latitude and longitude of any place, you can locate it on the map as easily as on the globe. And yet on my map there isn't very much distortion in the shape of Europe."

II

"These fourteen hundred years have not produced a greater map-maker than Ptolemy," thought Gerard Mercator, bending over the map he was making. "What I most admire in his work is the way in which he subdivided the surface of the globe by means of meridians and parallels. Some day I hope to issue Ptolemy's maps again to the world, corrected, of course, to include the great discoveries in Africa, Asia, and America."

Well might young Mercator admire Ptolemy's maps, for in spite of fourteen centuries, they were in many ways more accurate than the maps of his own day. No one knew this better than Mercator, who was a map-maker by trade; that is, merchants paid him to

make charts for them. In those days, maps of various lands did not for the most part exist, or, if they did, were drawn so carelessly that they were of little use to a merchant who needed exact information about roads, rivers, hills, swamps.

Sea-captains and sea-traders made Mercator's workshop in Louvain their meeting-place, enriching his knowledge with the facts of geography they brought. He, in turn, was the man who furnished them with exact information about the whole globe. Mercator was busy not only drawing maps and engraving charts, but also in making globes and instruments for the navigator. It was acknowledged throughout Louvain that Gerard Mercator's instruments were more accurate, and his charts better drawn, than anyone else's.

When business was slack, visitors found Mercator working on a map of his own.

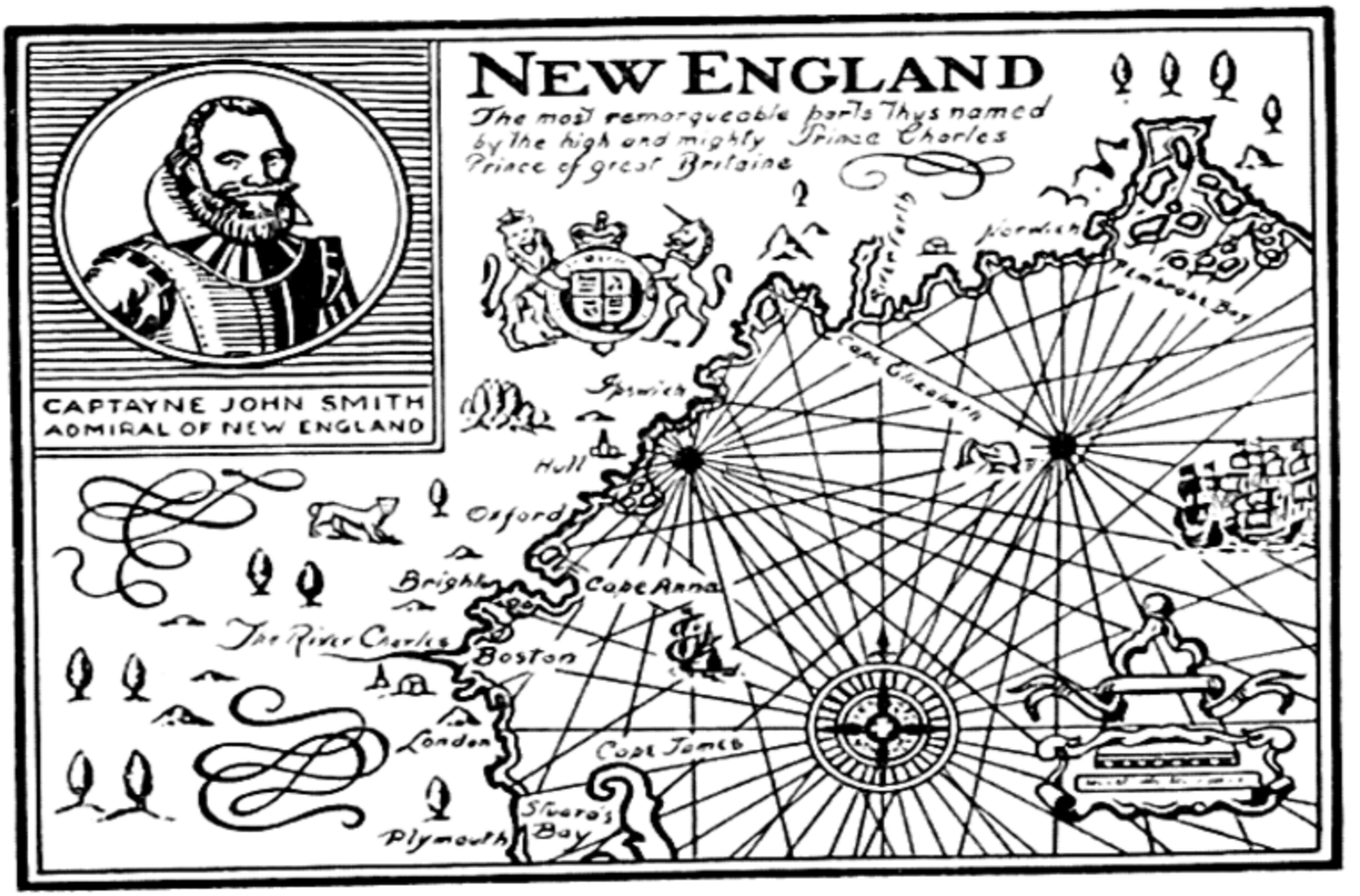
"He is making a map of Palestine," those who watched him explained. "He goes about it in a new way. He looks into the Bible, he consults travel books, old maps, and charts. He does not just copy maps others have made."

Gerard Mercator, born of parents too poor to send him to school, and educated only because of the interest his uncle took in him, had become the finest map-maker in Europe.

"These fourteen hundred years have not produced a greater map-maker than Ptolemy," Mercator believed. Yet he was not satisfied with Ptolemy's way of making a map. And even less did he approve of the maps of his own day. They were of two kinds. First, there was the circular map that looked like a T inscribed in an O. Within the upper part of this circle was drawn Asia; within the lower left portion, Europe; within

the lower right, Africa. The top of the map, therefore, was east. Jerusalem was put in the centre. There were no meridians. There was no accuracy. There was no New World. That was the T-in-O map.

Then there was the portolano, or sailors' chart, that gave directions for sailing along certain coasts.



A PORTOLANO CHART OF NEW ENGLAND

As such it was an excellent chart, but not a true map. It was merely useful to seamen who rarely ventured far from shore. Therefore, there was little detail of land in the interior of a coast. Seamen were not supposed to care about mountains, rivers, and cities away from the coast.

There were no meridians on the portolano map. But, for the sailor's guidance, the map was criss-crossed with lines radiating from many known points.

These lines, thirty-two of them usually, were called wind roses or compass roses, and they offered the chart-maker an opportunity to display his artistic talents. He lavished bright colours on them.

The chart-maker of Mercator's time often hid his ignorance with art. He filled in the blank spaces with fanciful designs. Deserts he decorated with fabled monsters; seas with ships and gaudy sea-serpents. Banners in brilliant colours flaunted through the chart. A beautiful border, perhaps in gold or silver, finished off the chart.

"These portolano maps are artistic, but they are not geographic," thought Mercator. "Ptolemy's map at least gave the latitude and longitude of every place. Too bad then that we cannot use Ptolemy's map, but it is impossible to fit the New World in it. There must be a better way to map the globe than by either the portolano or Ptolemy's maps. What is it?"

The portolano maps had one feature that Mercator's clients liked. They contained good directions for sailing. Ptolemy's map had no such feature. That was because Ptolemy had projected all the curved lines of the globe on to a cone; consequently, the lines on the map did not run in their true direction. A ship's pilot, attempting to steer by Ptolemy's map, would only be bewildered by it.

"Which direction?" would wonder the bewildered pilot. Ptolemy's map would not answer the question. The portolano map did. It answered the pilot's question: "Which way?" But when he asked other questions, the portolano lied. "What is the distance from Hamburg to the island of Naxos in the Ægean Sea? How big is the island?"

The portolano did not admit the roundness of the earth. Its straight lines falsified distances, therefore, and distorted shapes. It could not truthfully answer the pilot's question: "How far? Locate the place for me." Ptolemy's map could.

"What I want," thought Mercator, "is a kind of



THE GREAT PROBLEM OF CHART-MAKING WAS SOLVED

map as helpful to the sailor as the portolano, and as truthful as Ptolemy's map."

Besides, neither the portolano nor Ptolemy was able to take in the whole world on one map. What was wanted, Mercator knew, was not another map, but another way of making maps.

Mercator tried an experiment somewhat like Ptolemy's. He cut a piece of paper in the shape of a rectangle. This he wrapped round his globe, so that

it touched the globe at the Equator only. The paper was now in the form of a cylinder. The next step was to transfer the picture on the sphere to the cylinder. Very well. Where the Equator of the sphere touched the cylinder, that line was the Equator on the cylinder. Unrolling the paper, Mercator saw that the line extended across the rectangle. To transfer the meridians of longtitude was easy; he just drew lines up and down at right angles to the equator. He took care, however, to space the meridians equally. The lines of latitude he drew parallel to the Equator, and the framework of the map was finished.

Mercator's skilled hand now sketched in the coastline of the continents. Carefully checking his work, he noted that the shape of the continents remained true.

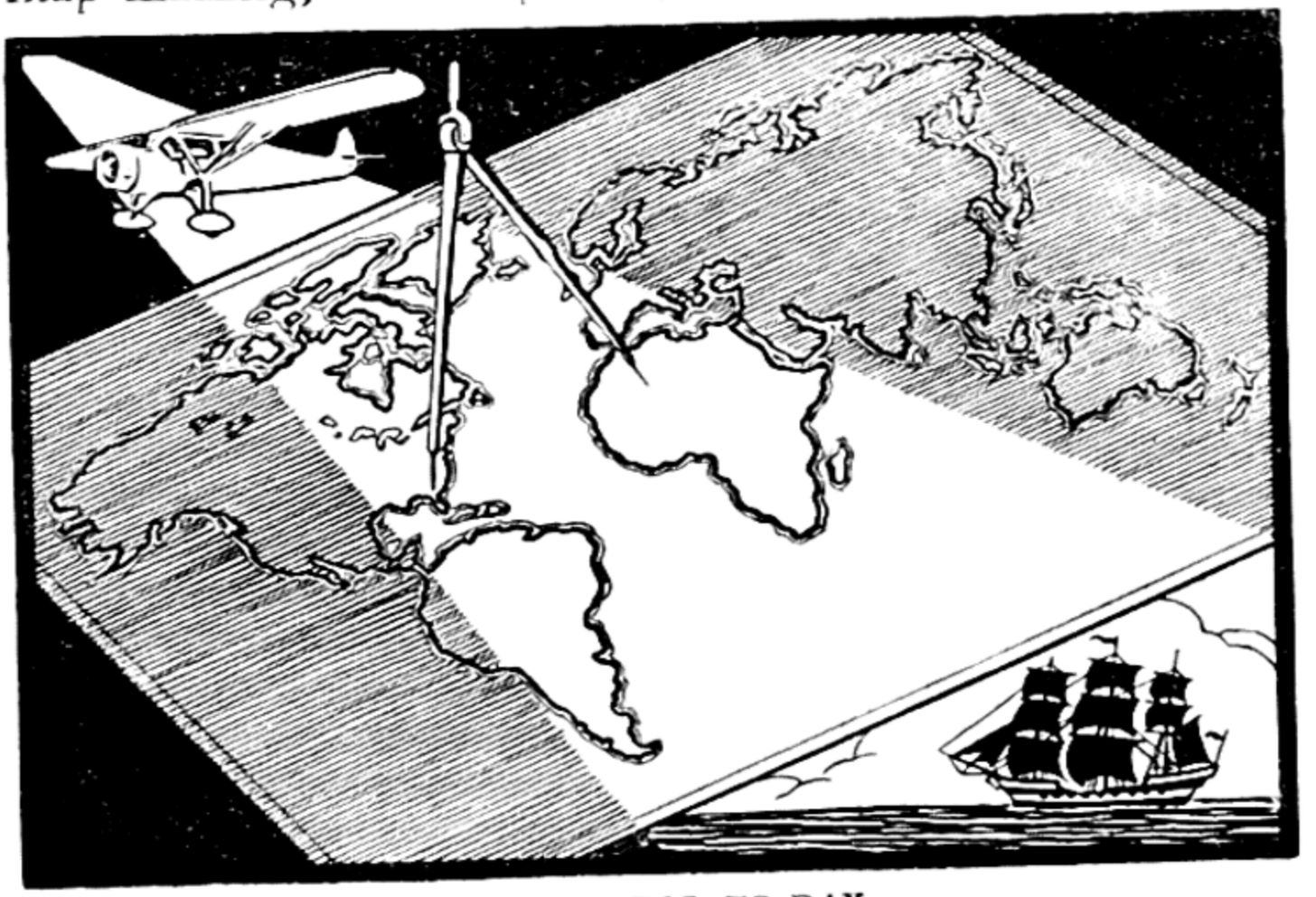
"And yet some one might complain that the land on my maps seems more and more stretched as one approaches the poles," admitted Mercator. "He would be right. On the globe, the meridians of longitude converge at the poles. On my map, they remain as far apart near the poles as at the Equator. That can't be helped. But the two things I wanted are on this map. First, the lines of latitude are perpendicular to the lines of longitude, which enables the navigator to follow his course on the map easily. Secondly, the shape of the land is true."

The great problem of chart-making was solved. Using this new type of map, since then called 'Mercator's projection,' Gerard Mercator fell to work on a complete set of maps of the world. He called the set an *Atlas*, after the giant in the Greek legend who held the world up on his shoulders. The *Atlas* of Mercator turned out to be more than a set of maps,

for it contained a description of the globe. And thus it not only corrected Ptolemy's "Geography," but supplanted it.

III

Mercator's *Atlas* appeared in 1585. Since that time map-making, like exploring, has grown ever more



MAP-MAKING TO-DAY

scientific. The explorer of to-day uses tools undreamed of by Columbus. So with the map-maker, or cartographer, as he is called. To-day, the cartographer has instruments precise enough to measure one eighty-thousandth of an inch. Therefore, his maps are much more accurate in detail than was Mercator's. To determine the longitude of a place, the modern map-maker no longer has to wait for a sailor to come home and

report on the position of the sun at that place; he telegraphs. Nor must he rely on the human eye and foot for his details; he goes up in an aeroplane and 'shoots' his air-camera.

Air-mapping is of greatest service to the geographer when he makes engineering maps, city plans, and coast charts. With the air-camera he can accomplish in a few hours a task of years by old-fashioned methods. Paris was mapped with eight hundred plates in less than one day of flying; Washington in two and a half hours with less than two hundred plates. And whenever an area becomes built up and so changed that its map has become worthless, it is re-mapped from the air. With his air-camera, the geographer also surveys parts of the earth which he cannot reach in any other way. For example, Mount Everest, which, with its glaciers, its burning cold, and its tremendous height, stopped expedition after expedition from reaching its summit, yielded at last to the geographer seated in an aeroplane.

He did not fly over Mount Everest to break an altitude record or to do a deed of daring. His purpose was to map a part of the earth that could not be mapped by any other way. Through his photographs the geographical features of Mount Everest's southern slope, startlingly different from the sides already known, were revealed for the first time. Magnificent spurs and fields of glaciers were beheld for the first time.

Yes, we have made great strides in the art of map-making. But on the wall of the schoolroom hangs an old map which the teacher now and then pulls down. It is the same sort of map printed in the textbook on Geography. The Mercator projection the teacher

perhaps calls it. It is easy to understand; so simple, so clear to the pupil. Once there was a poor lad named Gerard Mercator. Before him maps were hard to understand, clear to nobody. Gerard Mercator changed the map.

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